

CHAPTER III

AFFECTED ENVIRONMENT

INTRODUCTION

This chapter describes the environment of the area that could be affected by the alternatives being considered. Given the scope of the SEIS, much of the affected environment has already been described in the FEIS. Therefore, large portions of the FEIS affected environment are incorporated by reference, suitably referenced below. An effort has been made to focus only on those topics for which there is new information, with enough other discussion for convenience of the reader and for continuity with effects disclosed in Chapter IV.

In this chapter, mandatory EIS topics are reviewed with notations of their applicability in this process, and where they are discussed in either the FEIS (incorporated by reference) or the SEIS. New or updated information also presented in this chapter includes separate sections titled New Information Pursuant to SEIS Analysis, Park Service Operations, and Concession Winter Operations. These are not impact topics per se, rather they provide background context for the analysis.

MANDATORY TOPICS

CEQ regulations (40 CFR part 1500) and NPS policy (NPS DO-12) require that certain topics be addressed in every EIS. The FEIS, on pages 101-102, describes these mandatory topics with reference to the CFR, executive order, or other direction. The following table paraphrases the topic and references its disposition in either the FEIS or the SEIS.

Table 12. Disposition of mandatory impact topics.

Topic	Disposition	
	FEIS	SEIS
Possible conflicts between alternatives and land use plans, policies of other jurisdictions or agencies	See Direct, Indirect and Cumulative Effects on Adjacent Lands, p. 434	See Impact Topics Addressed in the SEIS
Energy requirements and conservation potential	Dismissed, page 101	See this chapter under the topic of National Park Operations
Natural or depletable resource requirements and conservation potential	Dismissed, page 101	Tier to FEIS

Topic	Disposition	
	FEIS	SEIS
Urban quality, historic and cultural resources	See Effects on Cultural Resources for each alternative in Chapter IV	See Additional Topics Dismissed in this SEIS
Socially or economically disadvantaged populations	See effects on Minority and Low Income Populations for each alternative in Chapter IV	See Additional Topics Dismissed in this SEIS
Wetlands and Floodplains	Floodplains dismissed, page 102. See Effects on Aquatic Resources for each alternative in Chapter IV	Tier to FEIS. See Additional Topics Dismissed in this SEIS
Prime and unique agricultural lands	Dismissed, page 102	Tier to FEIS
Endangered or threatened plants and animals	See Effects on Federally Protected Species for each alternative in Chapter IV	See Impact Topics Addressed in the SEIS
Important scientific, archeological and other cultural resources	See Effects on Natural Resources and Effects on Cultural Resources for each alternative in Chapter IV	See Additional Topics Dismissed in this SEIS
Ecologically critical areas, wild and scenic rivers, or other unique natural resources	Dismissed, page 102 and 106 except for topics associated with wildlife habitat	See Additional Topics Dismissed in this SEIS, and Impact Topics Addressed in the SEIS
Public health and safety	See Effects on Air Quality and Public Health, and Public Safety for each alternative in Chapter IV	See Impact Topics Addressed in the SEIS
Sacred sites and Indian Trust resources	See Effects on Cultural Resources for each alternative in Chapter IV	See Additional Topics Dismissed in this SEIS

IMPACT TOPICS DISMISSED

FEIS Topics Dismissed

A variety of impact topics were dismissed from extensive analysis in the FEIS. The FEIS, on pages 102-106 list the topics dismissed with a discussion of the rationale for doing so. The FEIS material is incorporated by reference into this SEIS. Topics dismissed are:

- Floodplains
- Black Bear (*Ursus americanus*)
- Mid-Sized Carnivores
- Subnivian Fauna
- Bullfrog (*Rana catesbeiana*)
- Birds
- Reptiles
- Exotic Species - Plants
- Exotic Species - Animals
- Mountain Goat (*Oreamnos americanus*)
- Vegetation

Additional Topics Dismissed in this SEIS

Additional impact topics are dismissed in the SEIS on the basis that the impacts have been disclosed in the FEIS, and no new information or alternative formulation results in impacts that would be any different. The decision to be made will not hinge on these topics relative to direct, indirect or cumulative impacts. Therefore, the following topics are dismissed from additional analysis in the SEIS, and the FEIS analyses are concurrently incorporated by reference as indicated in each discussion below.

Avalanche Hazards: Avalanche hazards are sufficiently described in the FEIS on pages 137-139 of the FEIS. Regardless of any alternative being considered, this hazard remains more or less constant. It remains within the discretion of NPS to institute measures at any time to protect public safety by closing areas to travel, by prohibiting stopping along some road segments, by prohibiting some uses, or other means that may be conceived on a case-by-case basis. Some alternatives in the SEIS might require more in the way of avalanche hazard mitigation because of certain visitor use features, but these situations have already been determined. Sylvan Pass is the avalanche area most at issue, because access through the East Entrance from Cody is involved. Frequent severe weather often necessitates closing the road to all visitation, sometimes for extended periods until storm cycles clear and control work can begin. Experience has shown that it is unsafe and unproductive to try to open the road during a winter storm. Avalanche control measures in place to facilitate winter access over Sylvan Pass are hazardous to employees who perform this function. This topic is being dismissed from further analysis, but mitigation is incorporated as needed, and the FEIS discussion is incorporated by reference.

Minority and Low Income Populations: This aspect of the social and economic analysis was demonstrated in the FEIS as something that did not vary significantly through the range of alternatives considering the relatively high cost of accessing the parks during the winter by any mode of transport. See FEIS Chapters III (page 113) and IV (pages 225, 272, 306, 333, 357, 379, 406). FEIS alternatives B and C offered the greatest potential for making winter access more affordable to low income populations. Overall, however, the demographic result associated with any alternative remains about the same in terms of income and ethnic background. Affordability of access remains a concern to be dealt with during the implementation of the plan, regardless of the programmatic outcome.

Cultural Resources: Through the entire range of alternatives evaluated in the FEIS, with the prescribed mitigation there would be not be any adverse effects on archeological or historic resources, ethnographic resources, cultural landscapes, sacred sites or Indian Trust resources. See the mitigation section in Chapter II of the SEIS, and FEIS Chapters III (pages 171-175) and IV (pages 265, 294, 326, 351, 372, 398, 427).

Geothermal Resources: Impact evaluation in the FEIS for most alternatives indicates that there are and would be minor adverse effects on the integrity of the geothermal resource itself as a result of winter use. The risks of impact may vary somewhat by alternative, left unmitigated. For the alternatives being further considered in this SEIS, there is essentially no greater potential impact than minor adverse impacts, which can be mitigated. See the mitigation section in Chapter II of the SEIS, and FEIS Chapters III (page 139) and IV (pages 229, 278, 310, 337, 360, 383, and 413).

Water and Aquatic Resources: Through the entire range of alternatives evaluated in the FEIS, there are no demonstrable adverse effects on water or aquatic resources based on existing information. Left unmitigated, the risks of impact may vary somewhat by alternative. For the alternatives being further considered in this SEIS, there is no potential for changes in the relative risks based on information about new technology. With any of the alternatives, application of a monitoring program and adaptive management represent appropriate protective actions regarding water and aquatic resources. See the mitigation and monitoring sections in Chapter I and Chapter II of the SEIS Alternative Features not Reevaluated in this SEIS, and FEIS Chapters III (pages 171-175) and IV (pages 230, 279, 311, 337, 361, 383, 414).

Wildlife and Uses Not Pertaining to Oversnow Motorized Access: Impacts unrelated to oversnow motorized use (e.g., wheeled vehicles, plowed roads, and nonmotorized recreation) are outside the scope of this SEIS. The evaluation of such impacts, by alternative, was analyzed in the FEIS and is incorporated by reference. See FEIS Chapter IV, pages 238-253, for a complete review under alternative A. Other FEIS alternatives compare and contrast effects to wildlife relative to alternative A. In regard to the effects of nonmotorized uses on wildlife, the existing decision closes or restricts areas to nonmotorized use where wildlife winter habitat concerns exist in the three park units. This aspect of the existing decision is not material in regard to new snowmobile technology, or to potential impacts of snowmobiles. Therefore, the analysis will not be revisited in the SEIS.

Ungulates Other Than Bison and Elk: Because 1) there is no new information on ungulate species other than bison and elk to report in the affected environment, and 2) no new impact are associated with the alternatives presented in the SEIS, the analysis of effects to these species disclosed in the FEIS is incorporated by reference. See FEIS, Chapter IV, pages 238-245 for a complete review under alternative A. Other FEIS alternatives compare and contrast effects to ungulate species relative to alternative A.

Wildlife Species of Special Concern: Regarding motorized and nonmotorized use, effects on species of special concern, the impacts of alternatives considered in this SEIS will not vary in scale from those disclosed in the FEIS. Mitigation measures, including monitoring and adaptive management, are incorporated into all the alternatives based on the FEIS analysis. Therefore, impacts on species of special concern are not reevaluated in this FEIS, but are incorporated by reference. See FEIS Chapter IV, pages 253 - 260, for a complete review under alternative A. Other alternatives compare and contrast effects on species of special concern relative to alternative A.

Federally Protected Species: Regarding motorized and nonmotorized use effects on federally listed species, the impacts considered in this SEIS will not vary in scale from those disclosed in the FEIS, and no new impacts are associated with any of the proposed alternatives. Mitigation measures, including monitoring and adaptive management, that are necessary to ensure there are no greater than negligible or minor adverse impacts are incorporated into all the alternatives based on the FEIS analysis. Furthermore, no new information on these species that would alter the assessment of effects is available. Therefore, impacts on these species are not reevaluated in the SEIS, but are incorporated by reference. See FEIS Chapter IV, pages 245-253, for a complete review under alternative A. Other FEIS alternatives compare and contrast effects on federally protected species relative to alternative A.

IMPACT TOPICS ADDRESSED IN THE SEIS

The impact topics that remain to be discussed are those relating to new information for which analysis may have altered the assessment of effects from that presented in the FEIS. For some impact topics, even though reported effects might be different, there may be no new information specific to that impact topic to present in the affected environment. For example, there may be no new information to discuss about visitor experience in the affected environment section. However, new technology or other means of mitigation in an SEIS alternative could result in impacts that are different from those disclosed in the FEIS. In instances such as this, information provided in the FEIS is incorporated by reference, and

summarized and referenced appropriately in the SEIS. A determination that there is no new information to report about a topic in the affected environment, and no new impacts that would vary by alternative in this analysis, would result in the dismissal of the topic from the SEIS.

Impact topics addressed in this chapter are listed below. New information or appropriate references are provided under each specific topic heading later in this chapter.

Table 13. Impact Topics Addressed in the SEIS.

TOPIC	FOCUS OF ADDITIONAL ANALYSIS
Socioeconomics	New economic information has been provided by the State of Wyoming. Some alternative provisions may allow a more refined analysis compared to the FEIS. See SEIS pages 97-103 and 150-166.
Air Quality and Public Health	Industry information about available “cleaner and quieter” snowmobiles, and additional information about snowcoach emissions and sound, may alter analysis of effects. Also, effects of interim limits on snowmobile use will vary by alternative in regard to this topic. See SEIS pages 107-115 and 174-206.
Public Safety	Effects of interim limits on snowmobile use will vary by alternative in regard to this topic. See SEIS pages 107-119 and 166-173.
Wildlife: Bison and Elk	Some alternative provisions may allow a more refined analysis compared to the FEIS, showing differences between alternatives. See SEIS pages 120-129 and 207-221.
Natural Soundscapes	Industry information about available “quieter” snowmobiles, and additional information about snowcoach sound, may alter analysis of effects. Also, effects of interim limits on snowmobile use will vary by alternative in regard to this topic. See SEIS pages 130-131 and 222 to 250.
Visitor Access and Circulation	Effects of interim limits on snowmobile use will vary by alternative in regard to this topic. See SEIS pages 132-135.
Visitor Use	Effects of interim limits on snowmobile use will vary by alternative in regard to this topic. See SEIS pages 135-138.
Visitor Experience	Industry information about available “cleaner and quieter” snowmobiles, and additional information about snowcoach emissions and sound, may alter analysis of effects. Also, effects of interim limits on snowmobile use will vary by alternative in regard to this topic. See SEIS pages 139-146.
Adjacent Lands	Effects of interim limits on snowmobile use varies marginally by alternative in regard to this topic. See SEIS pages 273-286.

NEW INFORMATION PURSUANT TO SEIS ANALYSIS

As presented in Chapter I, the scope of analysis is limited primarily to changes based on new information provided by ISMA regarding snowmobile technology. This is a function of the settlement agreement between ISMA and NPS. Subsequent to the settlement agreement, information has been submitted by ISMA and by others with the idea that the information would be of some use in the SEIS analysis. Below, following a discussion of the role of technology in the FEIS and the SEIS, a tabular presentation shows all information submitted. Included in the table is a summary assessment of the information in light of the scope of analysis and the settlement agreement. All submitted information was reviewed and considered. That which is most pertinent to the analysis is presented in SEIS Appendices C and D, either in full or as a summary. Assessments of the information by NPS are included in the administrative record.

In the FEIS, two alternatives presented objectives for development and use of oversnow motorized vehicles in regard to pollutant emissions and noise. These objectives were referred to in the alternatives using the descriptive shorthand terminology “clean and quiet.” In FEIS alternative B (FEIS page 42), where snowmobiles would be allowed, only snowmobiles that reduce hydrocarbon emissions 70%, carbon monoxide 40%, and particulates 75%, would have access into the parks¹. In terms of sound, only snowmobiles producing 70 decibels (dB) or less² would be allowed. Industry and local providers of machines would have until the winter of 2008-2009 to fully implement these provisions. Alternative D (FEIS page 48) would provide for the same reduction of emissions, but would further reduce the allowable decibel level to 60 dB, by 2008-2009. See table below for a comparison of unit standards relating to pollutant emissions and current technology.

¹ No increases in other pollutants would be allowed. The baseline for comparison is emissions from current 2-stroke machines.

² Measured on the A-weighted scale at 50 feet, running the machine at full throttle.

Table 14. Comparison of standards for pollutant emissions and current technology.

Standard Pollutant	FEIS Alternatives B, D (2008-2009) ³	EPA Proposed Standard (2010)	Arctic Cat [®] 4-stroke Machine (11/5/01 Model)
CO (g/kW-hr)	238.2	200	58.8
HC (g/kW-hr)	60.6	75	6.33
PM (ppm)	0.3	No standard	Not reported
Other	No increase	No standard	NOx: 19 g/kW-hr

In earlier comments from EPA, it is noted that these measures would not ensure adequate mitigation of impacts from pollution and noise without some attention to the number of machines that would be allowed, and without implementing the measures before 2008-2009. Other comments, subsequent to the FEIS, the decision and the publication of a rule, indicate that many who are opposed to closing the parks to snowmobiles are under the impression NPS did not consider new technology in making the decision. NPS did consider objectives that might be attained which would require the application of new technology. The approach is the same in this SEIS (i.e., objectives for pollutant and sound reduction as alternative descriptors) except that, relative to the settlement agreement, there is an indication from industry that it is capable of and intends on making machines available to reduce emissions and noise. The degree to which the reductions meet some objectives evaluated in the FEIS is the subject of this analysis. NPS was provided a letter written by Arctic Cat[®] to the State of Montana, which attests to the reliability and immediate availability, in unlimited quantities, of its cleaner and quieter 4-stroke snowmobile. This letter is contained in the administrative record for the SEIS.

The following table lists information submitted by ISMA and cooperating agencies, or by others acting in their behalf, that was contributed to the SEIS process. All the listed information was reviewed and considered for inclusion in the document or analysis as appropriate by NPS and by the analysts who are under contract to provide specific expertise.⁴ Based on this consideration and the date upon which the information was received, it was used to the extent possible in either the DSEIS or the analysis models for specific impact topics. As with any other information that is available, the decision-maker has the discretion to consider whether it is relevant within the scope of analysis, and to use the information as he or she desires.

³ Uses EPA baseline assumptions of 397 g/kW-hr for CO and 149 g/kW-hr for HC. Baseline for PM is from the FEIS.

⁴ Section 6 of the settlement agreement requires ISMA to provide new technology information to the park service by July 29, 2001. The concurrent agreement between NPS and Wyoming requires the state to provide new information by August 14.

Table 15. Listing of materials presented as new information, and a summary of how each was considered.

Materials Presented as New Information	Location of Information	Description of Information and its Use
ISMA Letter of Aug. 7 - Promotional material on 4-stroke snowmobiles.	DSEIS Appendix C	Letter submitted by ISMA to meet settlement agreement commitment. No data sufficient for changing emission/sound model inputs.
ISMA Letter of September 28 - Response to NPS letter of 9/10.	DSEIS Appendix C	Letter submitted by ISMA to meet settlement agreement commitment. No data sufficient for changing emission/sound model inputs.
ISMA Letter of October 9 - Emissions data on prototype 4-stroke snowmobiles	DSEIS Appendix C	Letter submitted by ISMA to meet settlement agreement commitment. Prototype information for HC and CO. No noise or particulates data.
ISMA Letter of November 8 - Data on production model 4-stroke snowmobiles	DSEIS Appendix C Model inputs Ch. IV Air	Letter submitted by ISMA to meet settlement agreement commitment. Production model information for HC and CO. No noise or particulates data provided.
"Determination of Snowcoach Emission Factors" (SwRI) 12/5. Provided by the State of Wyoming.	DSEIS Appendix D Model inputs Ch. IV Air	Information was considered, but not used in its entirety for the DSEIS due to lack of time. It will be reviewed further and used as revised model inputs for the FSEIS.
"American Voters Views on Snowmobiles in National Parks" (ISMA). Provided by the State of Wyoming.	Planning Record	Does not provide information on new snowmobile technology, and does not add to data for other analyses.
"The 2000-2001 Wyoming Snowmobile Survey" (UW). Provided by the State of WY.	DSEIS Chapter III, Summary in Appendix D	Information used to modify affected environment discussion for socioeconomics.
"Review of Research related to the Environmental Impact Statement for the Yellowstone and Grand Teton National Parks and the John D. Rockefeller, Jr., Memorial Parkway" (Institute for Environment and Natural Resources, 2000). Provided by the State of Wyoming.	Planning Record	Information is not new. It was considered prior to the publication of a decision in Nov. 2000. It does not provide information on new snowmobile technology. It does not provide alternative methodologies, literature, or basic data that would lead to new conclusions (per 40CFR1503.3b).
"Review of Documents and Recommendations of the Winter Use Plans Final Environmental Impact Statement" (Western EcoSystems Technology, Inc. 2001. Provided by the State of Wyoming.	Planning Record	Does not provide information on new snowmobile technology. It does not provide information on alternative methodologies, literature, or basic data that would lead to new conclusions (per 40CFR1503.3b).
"Oversnow Vehicle Sound Level Measurements" 10/30. JHSI. Provided by the State of WY.	DSEIS Appendix D Model inputs Ch. IV Sound	Information was used to a degree, but not used in its entirety in the DSEIS considered, but not used for the DSEIS due to technical disagreement and lack of time. NPS and Wyoming agreed to perform more comprehensive sound

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Materials Presented as New Information	Location of Information	Description of Information and its Use
		measurements for FSEIS in February 2002.
"An Expert Opinion on the Reasonableness of the Cooperating Agencies' Alternative #2 for Inclusion in the Yellowstone Winter Use SEIS" (Haas, 2001). Provided by the State of Wyoming.	Planning Record	Does not provide information on new snowmobile technology. Is used by Wyoming in developing the features of its "cooperating agency alternative" (alternative 2 in this SEIS).
Proposed EPA Rule. Provided by EPA.	Planning Record DSEIS Chapter III	Rule making is discussed in SEIS, along with EPA concerns regarding any SEIS assumptions based on the rule. Outcome of rule-making process is distant and uncertain.
"After-Market Improvement of 2-stroke Snowmobiles". Provided by Jerry Jardine, Dubois, WY.	DSEIS Appendix D	Supports concept that 2-stroke machines can be cleaner and quieter.
"Status and Potential of 2-stroke Technology in Montana" (MDEQ). Provided by the State of Montana.	DSEIS Appendix D	Supports concept that 2-stroke machines can be cleaner and quieter.
"Comparison of CO Emissions from Snowcoaches, 1997 and 2001 Snowmobiles, and 2001 Clean Snowmobile Challenge New Technology and Applications" (MDEQ). Provided by the State of MT.	DSEIS Appendix D	Supports concept that snowmobiles can be cleaner and quieter.
The Electric Snowmobile Demonstration Project. Provided by the State of Montana.	DSEIS Appendix D	Information, though interesting, is speculative and insufficient for analysis purposes.
"Society of Automotive Engineers 2001 Clean Snowmobile Challenge". Provided by the State of Montana and Teton County, WY	DSEIS Summary in Appendix D	Indicates that some FEIS alternative objectives could feasibly be met using both 2 and 4-stroke technologies. Does not reflect on production capability. May point to emerging best available technology.
MSU-Billings Poll. 12/6. Provided by the State of Montana.	Planning Record	Does not provide information on new snowmobile technology. Does not add to information about public preferences that already exists in the FEIS.
"Economic Importance of the Winter Season to Park County, Wyoming" (UW). Provided by the Park County, WY.	DSEIS Appendix D	Does not collect or evaluate new data and does not provide new input estimates that could be used in SEIS economic modeling.

PARK SERVICE WINTER OPERATIONS

The following discussion is intended to explain the details of administrative or other use of snowmobiles by NPS personnel, and it further supports measures that were included in the November 2000 Record of Decision.

Policy or Other Guidance

Executive Order (EO) 11644 (Use of Off-Road Vehicles on the Public Lands, section 1(3)(B)) specifically exempts “official use” of off-road vehicles. “Official use” means use by an employee, agent, or designated representative of the federal government or one of its contractors in the course of his or her employment, agency, or representation (Section 2(4)). EO Section 8 states the agency shall monitor the effects of the use of off-road vehicles on lands under their jurisdictions, and shall amend or rescind designations as necessary to further the policy of this executive order. Policy (8.2.3.2 Snowmobiles) states: “NPS administrative use of snowmobiles will be limited to what is necessary to manage public use of snowmobile routes and areas; to conduct emergency operations; and to accomplish essential maintenance, construction, and resource protection activities that cannot be accomplished reasonably by other means.” YNP and GTNP use of snowmobiles, as described below, are authorized under this direction. Such use should be dictated by need as expressed in the guidance. The parks have stated that use of such machines will follow policies on “minimum requirement” by reducing fleet size and by using technologies that minimize environmental effects (see ROD pages 3, 5, and 6 for measures the parks will implement).

Administrative Use

YNP had 106 administrative snowmobiles in its fleet in the winter of 2000-2001. Employees in all aspects of winter operations use the machines. The fleet includes Polaris Trail Touring, Sport Touring and Wide Track models. Typically one-quarter to one-third of the fleet is turned over each year, so that the snowmobiles are usually no more than four years old. On average, approximately 2,000 miles are put on each snowmobile annually. Some of the older machines, however, have more than 6,000 miles before they are sold at auction. The park’s goal is to operate its snowmobiles generally no more than two winters to minimize repair and maintenance issues and to ensure the health and safety of employees. However lack of overall funding of the winter operations has meant that this goal is never met, and some employees are using snowmobiles that are well beyond their optimum service life.

Approximately 16,076 gallons of gasoline are used, as well as about 1,170 gallons of lubricating oil. YNP's administrative snowmobile fleet has used synthetic, biodegradable oil for engine lubrication since the winter of 1995-1996. As of the winter of 2001-2002, the biodegradable 2-stroke oil that had been used for a number of winters was not available; the park is substituting other synthetic oils. The fleet has operated on a blend of unleaded gasoline and 10% ethanol since the winter of 1998-1999.

YNP purchased 31 four-stroke machines for the winter of 2001-2002 for use in its administrative fleet to both replace older two-stroke snowmobiles and add to the snowmobile fleet. The park bought a mix of Arctic Cat and Polaris machines to be able to test the operation of different snowmobiles. The park has used one brand of snowmobile (Polaris) exclusively for many years, for ease of parts inventories and maintenance consistency. The Arctic Cat four-stroke machines are production models in 2001-2002, whereas the Polaris is a prototype. In addition, for the winter of 2001-2002, the park purchased ten wide-track and higher performance snowmobiles for specialized uses within the park such as search and rescue and hauling heavier loads. The four-stroke snowmobiles cost between \$7,200 and \$7,600 each.

In addition to administrative snowmobiles, YNP operates 19 other oversnow vehicles. These include 8 groomers and 9 other tracked vehicles. The tracked vehicles include pickups, suburbans, an ambulance, and a van. For the winter of 2001-2002, two additional tracked ambulances will be in service to provide emergency medical response.

Goods and materials are also transported oversnow to support winter operations. Although all fuel and larger goods are transported to interior locations by wheeled vehicle before the start of the winter season, during the course of the winter, a large quantity of supplies are conveyed oversnow to support park personnel accomplishing their work in the winter.

Monitoring and Law Enforcement

Of the total use by YNP park staff, approximately 33 machines are assigned to the Resource and Visitor Protection Division. Many of these have been modified to include warning lights and decals so they are clearly identifiable as police vehicles, and they are used on road patrol in the winter. These machines put more miles on average than the balance of the park snowmobiles since they are used almost every day for longer-distance travel. Each winter, approximately 250 snowmobile-related tickets are issued.

Search and Rescue

YNP park staff responds to approximately 40 incidents each winter, including about 12 personal injury accidents and 14 search and rescue events. Of those search and rescue events, park staff are requested to assist outside agencies about six times each winter for searches outside park boundaries. Staff from the Resource and Visitor Protection Division accomplishes most of the search and rescue work, although all other park staff can be called on to assist in these events.

Personal Use by NPS Employees Living in the Park Interior

Approximately 94 permanent and seasonal employees and approximately 30 family members over-winter in the interior of Yellowstone National Park. The following table shows their distribution by location and work group. There are no employees of Grand Teton National Park or of the Parkway who presently are employed under these circumstances.

Table 16. Employees duty stationed in oversnow Yellowstone locations.

Work Group Location	Visitor Protection	Interpretation	Maintenance	Total
Old Faithful	8	5	11	24
Canyon Village	4	2	9	15
Lake	7	2	10	19
East Entrance	5	0	0	5
Madison	3	1	4	8
Grant Village	5	2	9	16
South Entrance	7	0	0	7
Total	39	12	43	94

When employees are offered employment in YNP, a condition of employment is that they must provide their own snowmobile for personal travel (for example, an October 2001 vacancy announcement for Engineering Equipment Operators stated, “During the winter, interior areas provide very limited services and are generally only accessible by snowmobile. A personal snowmobile is necessary for all personal use, i.e., for transportation in and out, and for food, supplies, and recreation.”)

Regulations regarding personal use of government property are found in 5 CFR 2635.704 Use of Government Property. Government vehicles, including snowmobiles, are government property and may not be used for unauthorized purposes. Personal use of a snowmobile is not considered an authorized purpose. Personal travel is defined as travel from their home for

purposes not related to official business. Examples of personal use include snowmobiling to a trailhead to ski on days off, snowmobiling to where their wheeled vehicle is parked so that they can grocery shop, or snowmobiling children to where their wheeled vehicle is parked so the children can go to school.

Historically, no restrictions have been placed on the type of snowmobiles that employees must use, and often snowmobiles are sold by departing employees to incoming staff. A number of seasonal park employees choose not to purchase a snowmobile for personal use and rely on others or do not travel out of the interior from late-November until late-March.

As stated in the FEIS, it is the park's intent to encourage employees to acquire environmentally friendly snowmobiles for their personal use. Achieving this goal will require either providing a fund source so that employees can purchase the snowmobiles for their use or authorizing personal use of government vehicles. The latter option would require a significant increase in the number of government-owned snowmobiles because many are shared by employees on the job. If a machine is taken out of service for personal use (such as on days off), another snowmobile must be available for the on-duty employee to use. Because of some of these issues, the Record of Decision on the FEIS stated a commitment to purchase administrative snowcoaches for employees' use. Federal agencies are authorized to provide mass transportation services to employees.

Concession Winter Operations

Considering the issue discussed above, relative to NPS use of snowmobiles, it is also appropriate to provide information about concessioner use of oversnow motorized vehicles in support of concession business. This use, as opposed to recreational use provided through concessions, may be viewed in the same context as NPS use, and therefore may also be considered at issue.

Policy or Other Guidance

Executive Order 11644 (Use of Off-Road Vehicles on the Public Lands, section 1(3)(C)) specifically exempts from the order any vehicle whose use is expressly authorized by the respective agency head under a permit, lease, license or contract. Concession contracts and operating plans can identify the need to use oversnow machines for administration of the business. Approval of contracts and plans could constitute authorization of these uses, being mindful of the same policies and guidance that governs NPS administrative use, and the need

for “minimum requirement” considerations. The following concession uses are deemed to be permitted under this guidance.

Concession Support Uses

Amfac Parks and Resorts uses 29 snowmobiles to support winter operations. During the winter of 2001 – 2002, Amfac is using the following snowmobiles for support use: 3 each 2002 Arctic Cat 4-stroke touring, 16 each 2002 Arctic Cat Panther 570 ESR, 8 each 2002 Arctic Cat Wide Track 550 and 2 each 2002 Yamaha – VK540EG. These snowmobiles travel a total of approximately 87,000 miles each winter and use approximately 5800 gallons of E-10 and 162 gallons of 2-stroke oil. In addition, Amfac typically uses two of its snowcoach fleet for administrative support (for example, for transporting laundry and supplies between Snow Lodge and Gardiner).

Yellowstone Park Service Stations has two snowmobiles (both 4-stroke for the 2001-2002 season) for administrative purposes, while the physician employed by Yellowstone Park Medical Services uses a park service snowmobile to access the interior. Hamilton Stores has no corporate snowmobiles; on occasion when winter access is required, personal machines are used.

Park guides and outfitters are also authorized to use snowmobiles and snowcoaches in the park for administrative access to repair or tow disabled vehicles.

Flagg Ranch reserves two snowmobiles for administrative use, though its operation is not dependent on this type of support. In the past, snowmobile use to support lodge operations has been rare. Flagg Ranch has the capability of using 4-cycle machines that have already been acquired. Ranch personnel state that if the road is not plowed (Highway 89/287 from Colter Bay to Flagg Ranch), two snowmachines would be needed by the winter caretaker. Grand Teton Lodge Company rarely uses snowmachines for administrative purposes, and to date only to access Jenny Lake Lodge to remove snow from roofs. The lodge company also use a gasoline-powered snowcat for this purpose, but would agree to use the cleanest, quietest machines. Two snowmobiles would likely be sufficient for this purpose. Triangle X Ranch maintains 6 snowmobiles, using 2-3 machines each day the ranch is open annually from December 26 to the end of March. The machines are used to transport guests’ luggage to cabins, and food to the lodge. They are also used to transport maintenance tools and materials, and to groom the nordic ski trail on the grounds. Signal Mountain Lodge does not operate during the winter, and does have any snowmachines.

Personal Use by Concession Employees Living in the Park Interior

Approximately 150 Amfac Parks and Resorts employees over-winter in the interior of the park. Amfac does not require that any of its employees provide their own snowmobile for personal travel. However, approximately ten employees own their own snowmobiles for personal travel. These employees use these snowmobiles to travel to and from the park interior a total of approximately 6,000 miles each winter season.

Yellowstone Park Service Stations also have two employees that over-winter in interior, and they are not required to provide their own snowmobiles for personal travel.

At present, there are no lodge company employees living in the interior of GTNP or the Parkway during the winter. Should the road not be plowed between Colter Bay and Flagg Ranch, suitable arrangements would need to be made for Flagg Ranch winter employees' personal needs.

SOCIOECONOMICS

Information in the affected environment section on socioeconomics in the FEIS is incorporated (along with all information sources cited) herein by reference. See FEIS pages 106-122. Topic summaries are presented below. It is supplemented by information derived from the 2000-2001 Wyoming Snowmobile Survey.

Regional Economy

The analysis area for the regional economy is a 5-county portion of the GYA. It includes the contiguous counties in Montana, Wyoming, and Idaho surrounding YNP, GTNP and the Parkway. The five counties are Fremont in Idaho; Gallatin and Park in Montana, and Park and Teton Counties in Wyoming. Most counties have an economic base dominated by tourism. Small communities adjacent to the park such as West Yellowstone, Gardiner, or Cooke City are highly dependent on park visitor spending, while larger communities (such as Bozeman, MT) derive a much smaller share of their economic activity from park visitor spending (a full discussion of this topic may be found on FEIS pages 106-109).

Income and Employment

The diversification of the economy in the GYA and the growth in the total number of jobs has helped keep unemployment in the five counties relatively low, at an average of 3.8% in 1997. A diversified blend of non-extractive industry sectors, including recreation, provides relatively stable employment base for the region. Most jobs pertaining to the recreation and tourism industry are found in the retail trade and services sectors of a county's economy. The recreation

and tourism sectors account for about 42% of the earnings in the 5-county area. Because of the world-renowned recreational resources available to the public within the GYA, these sectors are expected to continue to grow in importance (a full discussion of this topic may be found on FEIS pages 109-110).

Winter Recreation Sector

As stated in the FEIS, in the winter of 1998-99, YNP and GTNP visitors from outside Montana, Wyoming, and Idaho spent an average of \$1,129 during their trips. Of this amount, \$608 per person was reportedly spent in the GYA (Duffield and Neher 2000). Winter visitors to the park from within the GYA spend significantly less than out-of-state visitors, with \$210 per trip being spent within the GYA. The expenditure estimate for nonresident winter visitors from the 1999 winter visitor survey is similar to expenditure estimates from other studies.

The 2000-2001 Wyoming Snowmobile Survey provides an estimate by the state on economic inputs, reported here to provide the reader with information not available in the FEIS. Daily per person trip expenditures in Wyoming ranged from \$180.27 for outfitter clients to \$98.99 for nonresidents and \$68.50 for residents. Annual equipment expenditures in Wyoming ranged from \$2,306.13 for residents to \$329.94 for nonresidents, and \$64.11 for outfitter clients. The survey queried respondents (statewide) about behaviors that would result from a “ban” on snowmobile use in the parks. The state concludes from these data there could be a loss of up to 938 jobs, \$11.8 million in labor income, and \$1.3 million in government revenue in the state.⁵ This represents a very small fraction of the overall economic activity in the state and would not include the increases in economic activity to Montana, Idaho, Colorado, South Dakota and Utah due to the indicated increase in resident and outfitter client snowmobile trips to other regional trails.

In the context of the total GYA economy, expenditures by winter park visitors (and the additional economic activity that spending indirectly generates or induces) is a small portion of total GYA annual economic output. The direct, indirect, and induced expenditures generated in the GYA by nonresidents visiting the parks in the winter months are estimated at about \$63,000,000. In the context of the \$5.7 billion dollar annual output of the 5-county economy, this represents 1.1% of the total (Minnesota IMPLAN Group, County-level data 1996).

⁵ These figures are reported to contrast the state’s conclusions with NPS’ analysis of economic impacts. NPS submits these numbers significantly overstate potential impacts. The planning record contains rationale for NPS’ determination.

The statewide survey of snowmobiling (2000-2001) cited earlier was prepared by the Department of Agriculture and Applied Economics at the University of Wyoming. It was sponsored by The Wyoming Department of State Parks and Historic Sites, the University of Wyoming, and the Wyoming State Snowmobile Association.⁶ The survey process was designed to collect information on trail usage, expenditures, and user satisfaction for snowmobiling in the State of Wyoming. A sample of 1,019 nonresidents and 1,073 residents with registered snowmobiles were chosen randomly from the total Wyoming State Trail Program database. Respondents for the outfitter client survey were gathered with assistance from 22 of the 39 outfitters with registered commercial snowmobiles. Of the 326 returned outfitter client surveys, 277 were useable. Twenty of the 39 registered outfitters (representing 71% of the registered commercial snowmobiles in the state) participated in the snowmobile outfitter interviews. An executive summary of the report may be found in Appendix D. The reports describe methods and results in greater volume than can effectively be summarized in this SEIS.

Information in the survey includes the following. Snowmobile outfitters depend on snowmobile rental and guiding for about 92% of their winter business, and 70% of their total annual business. Average fleet size for an outfitter is 36 snowmobiles, with holidays and the month of February being their busiest times. The majority of clients come from outside Wyoming, and their numbers have increased 100% in the past four years. Use by outfitters in national parks comprises 23% of their business. Most outfitters (85%) feel that the decision to ban snowmobiles in YNP is unfair because they thought NPS did not adequately consider how it would affect their business. Thirty-five percent felt the ban was a "Clinton /environmentalist" agenda, and 25% are concerned how the ban would affect national forests or that forests would follow suit and ban use. Half the outfitters did not plan on making any changes to their businesses as a result of the ban, while others would plan on shifting more use to national forests and state trails. Forty-five percent of outfitters' preferred solution to the "snowmobile conflict within YNP" is to leave the situation as it was before the ban. The second most preferred solution (again, 45%) is to limit the number of snowmobiles per day or per season. The third highest-ranked answer, selected by 70% of the outfitters, is to require cleaner and quieter snowmobiles. Outfitters are concerned about the cost and performance of such machines (for example, they are slower and heavier than their clients desire). Other concerns are the potential for future bans and overcrowded state trails.

⁶ McManus, Coupal and Taylor, August 2001

The survey cites that most clients do not own their own snowmobiles, and nearly half had snowmobiles one year or less in Wyoming. Over 60% of clients traveled more than 1,000 miles (one way) during the past season. Most do not belong to snowmobile clubs. Fifty-six percent agree with the need for a cleaner and quieter snowmobile, and 64% are willing to pay more to use one. During the past season, the clients responding to the survey came to Wyoming for 72% of their trips, using state trails one third of the time and YNP or GTNP another third of the time. In terms of snowmobile-days, 63% were spent in Wyoming, with 35% on state trails and 27% on GTNP or YNP.

From the Wyoming survey, 57% of clients would change the number of trips made to Wyoming if they were no longer able to snowmobile in the parks, and 95% of these would decrease the number of trips. If snowmobiles were banned from YNP or GTNP, outfitter clients would decrease their total snowmobile trips by nearly 35%. Snowmobile trips to Wyoming by outfitter clients would decrease by over 52%. Trips to state snowmobile trails would decrease by 11% and to other Wyoming trails by 14%, indicating little substitution between sites. The results show some substitution to other parts of the region, with the number of trips increasing by nearly 21%, however there would be a net loss in total snowmobile days by clients both in total and in Wyoming. About 85% of outfitter clients would not be willing to consider going to YNP if the only mechanized access were by snowcoach, and 15% would consider using a snow coach.

The results from the 2000-2001 Wyoming Snowmobile Survey provides new information on trail usage, expenditure information and user satisfaction for snowmobiling in the State of Wyoming. The results represent resident, nonresident, and outfitter client snowmobile use of Wyoming State trails during the season of 2000-2001. Trips to YNP and GTNP trails accounted for 3.1% of resident, 4.6% of nonresident, and 33.2% of outfitter client snowmobile trips during the season. Much of the analysis contained in the FEIS is supported by data collected from winter visitors to the parks who were surveyed regarding their winter trips to the GYA. The economic impact analysis for the FEIS specifically focused on changes in winter visits to the GYA area and the resulting impact on the 3-state and 5-county level. Statewide information contained in the Wyoming survey is somewhat beyond the scope, or is not directly comparable to the FEIS analysis.

Snow condition ranked as the most important natural feature for choosing a Wyoming snowmobile area among nonresident and resident snowmobilers, with 80.8% of nonresidents and 63.8% of residents rating this aspect in the top three natural features. The two other

natural features that most attracted nonresident and resident survey respondents were off-trail powder areas and scenic views. Wildlife viewing was ranked as a top natural trail feature by 19.6% of resident respondents and 12.7% of nonresidents. Scenery, snow conditions, and reputation for snowmobiling were the most important factors for outfitter clients in the decision to snowmobile in Wyoming (see the *Visitor Experience* section later in this chapter).

The preferred solutions for "resolving the snowmobile conflict in national parks" as indicated in the 2000-2001 Wyoming Snowmobile Survey are presented in greater detail in the visitor experience section. Briefly, the majority of residents (nearly 70%) prefer that there would be no ban on snowmobiles. Half of these prefer a requirement for cleaner and quieter machines, and half want no additional requirements. About 20% of resident snowmobilers prefer a solution that limited snowmobile access by day or by season. Over 37% of nonresident respondents prefer no ban and no additional requirements. As a solution, 28% favor cleaner and quieter machines, and almost 30% favor either a partial ban in highly sensitive areas or more limited access by day or by season.

Half of resident Wyoming snowmobilers did not see a need for cleaner and quieter snowmobiles but 50% also said they would pay more to use them if these vehicles were available. A minority of nonresidents (28.2%) thought there was a need for cleaner and quieter snowmobiles, but 50.5% of all respondents said they would pay more to use them if these vehicles were available. A majority of outfitter clients (56%) thought there was a need for cleaner and quieter snowmobiles and over 64% said they would be willing to pay a higher price to use them.

Snowmobile Expenditures in Wyoming

The Wyoming snowmobile survey states that over 78% of outfitter clients, 89% of residents and 97.3% of nonresidents indicated that snowmobiling was their primary purpose for traveling to Wyoming during their most recent visit. Trips to YNP and GTNP accounted for 3.1% of resident, 4.6% of nonresident, and 33.2% of outfitter client snowmobile trips during the 2000-2001 season.

Outfitter clients would make the most changes of all Wyoming trail users if YNP and GTNP were closed to snowmobile access; nonresidents and residents would also be affected but to a lesser degree. Resident, nonresident and outfitter clients indicated they would decrease their annual overall total number of snowmobiling trips by 2.5%, 11.4%, and 34% respectively. Resident, nonresident and outfitter clients indicated they would decrease their annual

snowmobiling trips to Wyoming trails by 5%, 10.4%, and 52.3% respectively. However, the survey results do indicate some substitution to other trails within the region (MT, ID, CO, SD, and UT) with the number of resident trips increasing by 52.1% and outfitter client trips increasing by 20.6%. Nonresident snowmobilers indicated their use to other regional trails would decrease by 10.4%. The majority of Wyoming snowmobile trail users (84.6% of outfitter clients, 91.2% of residents, and 93.2% of nonresidents) would not consider going to YNP if their only mechanized access were by snowcoach tours.

Park Visitors

The survey results from the 2000-2001 Wyoming Snowmobile survey are, for the most, part consistent with the other survey results concerning the snowmobile experience discussed in Chapter III of the FEIS (pages 190-196). Small differences in the importance ranking of solitude and wildlife viewing are noted and may be due to the expected differences between a statewide recreation survey and park specific survey. Based on an evaluation of the survey results discussed in this chapter and in the FEIS, the most important aspects of visitor experience that relate to winter use plans for the national parks are the following.

- Opportunities to view wildlife
- Opportunities to view scenery
- The safe behavior of others
- Quality of the groomed surface
- Availability of access to winter activities or experiences
- Availability of information
- Quiet and solitude
- Clean air

More detailed discussions of these items may be found in the visitor experience section later in this chapter.

Some notable results from the Wyoming Snowmobile survey in regard to park use are as follows. Wyoming outfitter clients and nonresident and resident snowmobilers were satisfied or very satisfied with snowmobiling in Wyoming (98%, 97%, and 96% respectively). Residents and nonresidents indicated that the availability of parking was a concern. Nonresidents were also concerned with the availability of shelters, trail signing, trail maintenance and trail grooming. Over 79% of outfitter clients, 58.9% of residents, and 54.2% of nonresident snowmobilers had made a snowmobiling trip YNP at some point in their lives. YNP was ranked as the fifth most preferred Wyoming trail area for residents and nonresidents (24.7% and 27.8%, respectively). GTNP was ranked as the seventh most preferred Wyoming

trail area by nonresidents (15.5%) but was not ranked among the top ten preferred state trail areas by residents. Over 58% of outfitter clients indicated that the recent publicity regarding closing Yellowstone to snowmobiling access had encouraged them to snowmobile in Wyoming.

In 1999, winter visitors to YNP and GTNP were surveyed regarding their winter trips to the GYA, and their opinions about winter management of the national parks in the GYA. Respondents to the survey were asked what activities they participated in during their visits to the parks. Overall, 73.6% of park respondents reported snowmobiling, 10% reported riding a snowcoach, and 22.1% reported cross-country skiing as one of the activities participated in during their visit to the GYA. There were a significant number of people in the sample who reported participating in a combination of activities, for example snowmobiling and cross-country skiing, or riding a snowcoach and cross-country skiing. The survey found that the reported median household income for winter visitors was between \$60,000 and \$75,000 per year. The income level of winter visitors to the GYA varied greatly depending on where the visitor lived. Other survey conclusions: almost all the winter recreation visitors in the GYA are white (99.0%) and male (66%). This compares to summer visitors where 98% are white and 50% are male (a full discussion of this topic may be found on FEIS pages 111-114).

Social Values

The general public has strongly held and divergent values and opinions on public policy issues concerning winter management of YNP and GTNP. The following description is summarized from survey data and analysis performed by Duffield, et al., cited and discussed in the FEIS. Current winter visitors to YNP generally prefer the previous policy of grooming roads for snowmobile use. Among the general public, the local population was evenly divided between keeping the previous policy or allowing snowcoaches, ski and snowshoe access only. However, the regional and national populations preferred the snowcoach only option. Among national respondents there was also substantial support for allowing only skiing and snowshoeing. In general, visitors would like mechanized access into YNP in the winter. However, visitors are also concerned about wildlife and possibly other resource impacts. When faced with a specific choice (for example, help protect bison versus mechanized access), it appears that a majority of the public is willing to accept major changes in access policy.

A telephone survey undertaken in 1998 for Teton County, WY (Morey and Associates, Inc.) collected information on local resident winter participation and attitudes. The study found that

21% of households snowmobiled and 15% cross-country skied in Yellowstone in the winter of 97-98. In their usage of GTNP, 12% of residents snowmobiled, 46% cross-country or back-country skied, and 10% used snowshoes. A total of 52% of Yellowstone users and 56% of non-users feel snowmobiles negatively impact Yellowstone in the winter.⁷ Of these, 66% feel they are too noisy, 44% feel they affect air quality, 39% feel they disturb wildlife, and 25% feel there are too many. A total of 51% of users and 61% of nonusers feel that there should be admittance limitations in Yellowstone during the winter on snowmobiles. The survey also found that 7% of all respondents derive income from winter use in YNP or GTNP (discussion of this topic may be found on FEIS pages 115-121).

AIR QUALITY AND AIR QUALITY RELATED VALUES

Discussion of air quality and public health may be found on FEIS pages 123-128. The FEIS discusses existing concerns and information about snowmobile emissions. It presents a regulatory overview, National Ambient Air Quality Standards, and data from air quality monitoring programs. This information, incorporated by reference into this SEIS, is briefly summarized here. Additional information is reported under new research and EPA proposed rule. Over the past ten years, increases in the number of visitors using snowmobiles in YNP and GTNP have intensified concerns regarding air pollution and its effects on the health of park employees, visitors, and operators and riders of snowmobiles. A 2-stroke engine that provides a high power/weight ratio powers the typical snowmobile, and these engines produce relatively high emissions of carbon monoxide (CO) and unburned hydrocarbons (HC) compared to modern automobile engines. They also do not incorporate pollution control equipment. At the present time, there are no federal laws regulating snowmobile engine exhaust emissions⁸. CO is a colorless, odorless, and poisonous gas produced by incomplete burning of carbon in fuels. When CO enters the bloodstream, it reduces the delivery of oxygen to the body's organs and tissues. Health effects range from impairment of visual perception, manual dexterity, learning ability, and performance of complex tasks; to headaches and fatigue; to respiratory failure and death.

In addition to CO emissions, snowmobiles generate particulate matter (PM) and volatile organic compounds (VOCs). VOCs include air toxics or hazardous air pollutants such as benzene and formaldehyde. PM includes dust, dirt, soot, smoke, and liquid droplets directly

⁷ Teton County indicates that this statistic was derived from the nonmotorized user group, not the entire sample population.

⁸ EPA released a draft rule, which proposes to regulate snowmobile emissions, in September 2001. A final regulation is expected by September 2002. See discussion of the EPA proposed rule in this section.

emitted into the air by sources such as power plants, vehicles, construction activity, fires and natural windblown dust. Vehicle exhaust PM emissions also contain hazardous air pollutants such as 1,3-butadiene. Health effects from PM emissions include reduced lung function, aggravation of respiratory ailments, long-term risk of increased cancer rates, and development of respiratory problems. Snowmobile emissions have been the source of the vehicle emission and health related complaints in YNP.

YNP and GTNP are classified as mandatory Class I areas under the Federal Clean Air Act (42 USC 7401 *et seq.*). This most stringent air quality classification is aimed at protecting parks and wilderness areas from air quality degradation. The act gives federal land managers the responsibility for protecting air quality and related values. The Federal Clean Air Act, as amended in 1990, requires the EPA to establish national ambient air quality standards (NAAQS) to protect public health and welfare. Standards have been set for six pollutants: particulate matter less than 10 microns (PM₁₀), carbon monoxide (CO), nitrogen oxides (NO_x), sulfur dioxide (SO₂), ozone (O₃), and lead (Pb). These pollutants are called criteria pollutants because the standards satisfy criteria specified in the act. Table 28 in the FEIS (page 125) presents the standards for criteria pollutants, as purveyed under federal and state jurisdictions. The states of Montana and Wyoming have adopted more stringent standards for some pollutants. It should be made clear that jurisdiction for enforcement of NAAQS standards is delegated to the states. This is in contrast to the affirmative responsibility that lies with the federal land manager in the Clean Air Act to protect air quality and air quality related values (including visibility). Moreover, it is evident that the federal land manager has the authority and jurisdiction to manage activities within park boundaries that impact park air quality and air quality related values.

New Research

A research paper Snowmobile Contributions to Mobile Source Emissions in Yellowstone National Park was published in *Environmental Science and Technology* on the Worldwide Web June 7, 2001.⁹ The highly technical article presents its study methods, data, data sources, and results in modeling HC, CO and toluene emissions from snowmobiles entering Yellowstone National Park. The abstract concludes, in part, that snowmobiles account for 27% of the annual emissions of CO and 77% of annual emissions of HC using an equivalent best estimate for summer mobile source emissions. It states that use of oxygenated fuels in snowmobiles reduces CO emissions by about 13% (+ or – 6.5%), but produces no change in

⁹ Authored by Bishop, et al. Department of Chemistry, University of Denver, Denver, CO. in Vol.35, NO.14, 2001.

HC emissions. Also, it reports that liquid-cooled snowmobiles have higher HC emissions than fan-cooled machines by about 7 to 11%. On the concluding page of the article, authors state: “The large differences in emission rates between the over-the-snow vehicles and the on-road vehicles is balanced by the large excess of fuel which is consumed in the park during the summer. However, the difference in HC emissions speaks to the need for the snowmobile industry to move away from 2-stroke designs to more fuel efficient 4-stroke engines.”

EPA Proposed Rule

On December 7, 2000, EPA published several findings in the Federal Register in its advanced notice of proposed rule making. Among others, EPA found “that all land-based recreational nonroad spark-ignition engines....cause or contribute to air quality nonattainment in more than one ozone or carbon monoxide nonattainment area. We also find that particulate matter emissions from these engines cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare.” The reference to recreational vehicles includes snowmobiles. The finding also notes that recreational vehicles currently contribute about 8% of HC emissions and 5% of CO emissions from all mobile sources, which includes autos, trucks, trains, and buses.

On October 5, 2001 EPA published in the Federal Register proposed emission standards for several groups of nonroad engines that cause or contribute to air pollution, but that have yet to be regulated by EPA. This class of engines includes snowmobiles. The proposed regulation in its entirety and the supporting documents can be found at www.epa.gov/otaq/recveh.htm or by obtaining a copy of the 10/5/2001 Federal Register. The publication of the *Final* Emission Regulation is expected by September 13, 2002.

In brief, EPA’s proposed regulation would require snowmobile manufacturers to reduce emissions across their production fleets starting in 2006. The proposal would require reduced carbon monoxide (CO) and hydrocarbon emissions (HC) from new machines in two phases. Phase I, starting in 2006, would require reduced emissions of CO and HC in new machines by 30% from today’s baseline. Phase II, starting in 2010, would require reduced emissions of CO and HC in new machines by 50% from today’s baseline.

Table 15. EPA's proposed emission standards for snowmobile engines.

	Carbon Monoxide (g/kW-hr)	Hydrocarbons (g/kW-hr)
EPA Baseline	~ 400	~ 150
Phase I Standard Effective 2006 (reduction from baseline)	280 (30%)	105 (30%)
EPA Blue Sky	120	45
Phase II Standard Effective 2010 (reduction from baseline)	200 (50%)	75 (50%)

Fleet Averaging

EPA has proposed that these standards be implemented as “fleet averaged” standards. Fleet averaging means that each manufacturer’s production fleet would, on average, have to meet these emission reductions. In other words, a manufacturer could produce some machines whose emissions were worse than the standard, as long as that same manufacturer produced an equal number of machines with emissions that are that much better than the standard. EPA has proposed a detailed methodology and enforcement mechanisms to ensure that no manufacturers fleets will, on average, exceed the standard.

Noise

The proposed standard does not include any regulation of sound or noise from this class of engines.

Analysis and Implementation Issues Regarding EPA's Regulation of Emissions

EPA states that any analysis of impacts regarding air quality, or how the proposed regulation is viewed as a factor in the analysis, should incorporate several considerations. These are:

- EPA’s regulation of snowmobile emissions is in the proposal phase. EPA is taking public and industry comment on this proposal, and attempting to address concerns expressed by the Office of Management and Budget. Virtually any aspect of the proposal could change in the final regulation due out in September, 2002.
- The fleet averaging provision will complicate NPS’ analysis of the effects of the proposed standard. First, not all machines produced after 2006 or 2010 will meet the standard. High powered mountain, powder and hill climbing snowmobiles would be most likely to exceed the emissions standard. It is not easy to predict what percentage of machines will exceed the emissions standard, or by how much they will exceed it. There is no labeling requirement incorporated in EPA’s proposed regulation that would allow NPS to easily identify those machines certified as meeting the emission standard.
- All existing snowmobiles will be “grandfathered” into the regulation, meaning only new machines will be required to comply with the regulation. Therefore, there will be a period of time between the promulgation of the regulation and when the public fleet

of snowmobiles will, on average, reduce emissions equivalent to the regulated reductions. The ISMA has estimated the average life of a snowmobile at approximately nine years.

PUBLIC HEALTH AND SAFETY

Discussion of public health and safety in relation to winter use may be found in the FEIS on pages 123-139. Information provided below has been updated to incorporate public safety data obtained during the winter of 2000-2001. The FEIS discussion of air quality and public health (FEIS page 123) is fully incorporated by reference and not summarized or repeated here. NAAQS pollutants that affect public health are evaluated by alternative in the effects analysis. Levels of those pollutants represent an index to public health.

Public Health

Elevated levels of air pollution affect public health. The promulgation of NAAQS standards was specifically for the purpose of addressing the effects of air pollution on public health. The reader is referred to the previous section on air quality in which the effects of air pollutants on health are summarized.

Public Safety

Case Incident Reports—YNP

Rangers complete Case Incident Reports (CIRs) when they have been summoned to a specific location (Table 32). The content of the CIRs during the winter season vary widely; for example, they can report visitor assists for gasoline sales and snowmobile repairs, search-and-rescue assistance to other area agencies, or the presentation of a talk to a group of people. YNP compiled a draft report on CIRs involving winter recreationists in YNP and outside the park for which park rangers' assistance was requested for the period December 1995 to March 2001 (Wondrak 1998, rev. 1999, 2000, and 2001). The report covered CIRs that related to winter recreationists participating in snowmobiling, snowcoach riding, skiing, and hiking. Other winter recreational activities such as snowboarding, sledding, ice skating, and snowshoeing are conducted in YNP during the winter, but there were no CIRs associated with these activities in the seasons covered by the report. During the five winter seasons (1995-2001), about 384 (90%) of the CIRs involved snowmobiles (snowmobiles account for 62% of overall winter use). One CIR involved hikers, twenty CIRs involved skiers and twenty

involved snowcoach riders. The following table contains an accounting of the incidents by activity type.¹⁰

Table 16. Case incident reports from December-March 1995-2001.

Hiking Use	
Incident Description	Total Frequency
Agency Assist	1

Skiing Use					
Incident Description	Agency Assist	Avalanche Death	Search & Rescue	Visitor Assist	Misc.
Total Frequency	1	2	12	4	1

Snowcoaches		
Incident Description	Entering Closed Area	Visitor Vehicle Assistance
Total Frequency	1	19

Snowmobile Use	
Incident Description	Total Frequency
Abandoned	3
Agency Assist	51
Suspended License	3
Death	1
DUI	8
Entering Closed Area	19
Excessive Noise	3
Off-road Travel	12
Search & Rescue	4
Suspected Intrusion	9
Speeding	8
Unlicensed Driver	12
Unsafe Operation	7
Visitor Assist	222
Miscellaneous	22

[Note: Miscellaneous reports comprised the remaining 22 snowmobile CIR's.]

¹⁰ Agency assists are incidents in which NPS employees are contacted by the public safety departments from surrounding jurisdictions outside the park to provide assistance with situations such as search and rescue or incidents involving wildlife associated with the park. "Visitor assists" are events where a park visitor was provided assistance such as fuel, equipment repairs, minor first aid, or directions.

Emergency Medical Services Reports—YNP

Winter EMS reports for YNP were compiled for from 1995-2001 (Wondrak 1998, rev. 1999, 2000, and 2001; Table 33). Information is limited to the number of people who rangers reported assisting, and the types of activities that resulted in the incidents.

Table 17. EMS reports by activity type from December-March 1995-2001-- YNP.

Activity Type	Number of People Assisted	Percentage of total
Ice Skating	3	1%
Sledding (nonmotorized)	3	1%
Skiing	40	16%
Snowboarding	1	1%
Snowcoach riding	18	7%
Snowmobiling	154	62%
Snowshoeing	2	1%
Walking on boardwalks, etc.	29	12%

Source: NPS [Greater than 100% due to rounding]

Motor Vehicle Accidents—YNP

Winter motor vehicle accidents (MVAs) were also compiled for YNP (Wondrak 1998, rev. 1999, 2000, and 2001). The report excludes accidents that occurred on US Highway 191. Accidents that occurred on the Grand Loop Road and on the road between Gardiner and Cooke City, Montana, are included.

Vehicles

Not including the accidents that occurred on US Highway 191, there were 354 motor vehicle accidents from December through March 1995-2001. Of those 354 accidents, 230 (65%) involved snowmobiles, 104 (29%) involved private passenger vehicles, and 20 (6%) involved service vehicles such as busses, delivery vans, garbage trucks, snowplows, and snowcoaches. These numbers may be higher, as some accidents may go unreported. In FY 1998, snowmobilers comprised just 2% of the year's total visitors, but were involved in 9% of that year's MVAs.

Accident Descriptions

The most frequent types of motor vehicle accidents involving wheeled-vehicles in YNP (excluding US Highway 191) were:

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- Vehicle versus vehicle—35%;
- Vehicle versus animal (bison, elk, deer, sheep, or wolf)—28%;
- Single car accidents—18%; and,
- Vehicle versus inanimate object—19%.

The most frequent types of snowmobile accidents were:

- Snowmobile versus landscape feature (tree, river, rock, or ditch)—34%;
- Snowmobile versus snowmobile—32%;
- Lost control of snowmobile, rollovers, and swerves—17%;
- Snowmobile versus snowcoach—5%; and,
- Snowmobile versus bison—3% (most snowmobile versus bison accidents occurred after dark).

Owner

About 70% of all visitors use rented snowmobiles, and 75% of the snowmobiles involved in accidents from 1995-2000 were rental snowmobiles (Borrie 1999; Wondrak 1998, rev. 1999, 2000, and 2001). The US Government owned 7% of the snowmobiles involved in reported accidents, 14% were privately owned, and 2% were owned by YNP's concessioners (for employee use). This indicates that about 8% of people involved in wintertime MVAs in YNP are employees of the park or its concessioners. Similarly, about 7% of people involved in reported snowmobile accidents between 1995-2001 listed YNP as their home.

Contributing Factors

When completing MVA reports, rangers often explain why accidents occurred. When an explanation was provided, the following were cited as contributing factors to snowmobile accidents from 1995-2001:

- Lost control, 24%. (These often resulted from a rider mistaking the throttle for the brake, and consequently accelerating inadvertently while attempting to slow.)
- Poor driving skills, 23%. (For example, improper passing, driving left of center, driving the wrong way down a one-way road.)
- Inattention, 19%.
- Poor road conditions, 12%.
- Inexperience with snowmobiles, 8%.
- Bison in road, 5%.
- Defective machine, 3%.
- Swerving to avoid collision, 3%.
- Other, 2%.
- Alcohol, 1%.

Location

Over the six winters covered in the report, most snowmobile accidents (53%) occurred on the part of the Grand Loop from the West Entrance to the Old Faithful area. The section of the Grand Loop from Old Faithful to the South Entrance accounted for the next largest percentage of snowmobile accidents (21%). About 56% of the motor vehicle accidents involving wheeled-vehicles occurred on the road between Gardiner and Mammoth Hot Springs.

Time

About 90% of motor vehicle accidents involving snowmobiles occurred during daylight hours (8 A.M. to 5 P.M.). The remaining 10% occurred during the night and into the morning from 5 P.M. to 8 A.M. Travel during the night can be particularly dangerous because animals on the roadway are difficult to see. Most snowmobile versus bison accidents, which often result in serious injury, occurred during the night and comprised 41% of all nighttime snowmobile accidents.

Injuries

From 1995 to 2000:

- 72% of MVAs involving snowmobiles resulted in no reported injuries;
- 11% resulted in serious injuries;
- 16% resulted in minor injuries; and,
- 1% resulted in death.

Age

About 4% of snowmobile accidents from 1995 to 2001, when driver age was recorded, were caused by drivers between 10 and 15 years of age. This number is substantially lower than for the years prior to winter 1993-94 before the park began to require that snowmobilers be licensed drivers. Overall, 47% of snowmobile accidents were caused by drivers 35 and younger.

Citations—YNP

By far, the most common winter traffic violation in YNP is speeding on US 191. US 191 is a commercial route with a speed limit of 55 mph and is a major traffic corridor linking the cities of Bozeman, Big Sky, and West Yellowstone to Ashton and Idaho Falls. The highway is intended for and receives a substantially different sort of use than the Grand Loop road or even the Gardiner to Cooke City road. Information about citations issued on US 191 is not included here for this reason. Data was also collected on winter season traffic citations that

were issued to vehicle drivers during the past five winters. The results are discussed below by category.

Vehicles

Excluding those that occurred on US Highway 191, YNP's rangers issued 1581 traffic citations during December through March of 1995 to 2001. Of those:

- 88% were issued to drivers of snowmobiles;
- 11% were issued to drivers of wheeled-vehicles, including pick-up trucks, cars, SUVs, vans and mini-vans; and
- 1% were issued to drivers of bicycles, snowcoaches, or unspecified vehicles.

Snowmobilers comprised 62% of YNP's winter visitation during these years, outnumbering auto passengers by slightly more than 2 to 1.

Incident Descriptions

Of the 1386 citations issued to snowmobilers:

- 36% were issued for speeding;
- 17% were issued for off-road travel;
- 21% were issued for driving without a license or allowing another to do so;
- 11% were issued for failure to maintain control and/or unsafe operation;
- 8% were issued for traffic violations; and,
- 6% were issued for entering closed areas.

All other violations comprised 1% of overall snowmobile citations.

Case Incident Reports—GTNP and the Parkway

Analysis of case incident reports (CIRs) in GTNP and the Parkway includes those reports related to winter recreationists engaged in wheeled-vehicle operation, riding snowmobiles, participating in skiing and snowboarding, and as passengers in snowcoaches and snowplanes. CIRs involving wheeled-vehicles on US Highways 191/26/89 south of Moran Junction in GTNP were excluded, as that route is a major transportation artery with substantial use unrelated to recreation within the park areas. The summary of CIRs encompasses five winter seasons for the months of December through March 1995-2001 (Table 34).

Table 18. Case incident reports from December-March 1995-2001, Grand Teton National Park.

Skiing Use					
Incident Description	Agency Assist	Entering Closed Area	Injury	Pet in Closed Area	Search and Rescue
Total Frequency	1	1	1	3	8

Snowboard Use		
Incident Description	Agency Assist	Entering Closed Area
Total Frequency	1	1

Snowcoach Use	
Incident Description	Total Frequency
Visitor Assist	1

Snowmobiles	
Incident Description	Total Frequency
Agency Assist	27
Damage to Property	4
Entering Closed Area/ Off-Road	59
Misc. Traffic Violations	13
Parking	3
Search and Rescue	2
Suspected Intrusion	6
Underage Operation	3
Visitor Assist	4

Snowplane Use	
Incident Description	Total Frequency
Property Damage	1
Entering Closed Area	1

Wheeled Vehicle Use	
Incident Description	Total Frequency
Agency Assist	9
Entering Closed Area/Off-Road	14
Fail to Obey Traffic Device	17
Investigation	4
Misc. Traffic Violations	38
No Driver's License	15
Parking	42
Pet in Closed Area	11
Speeding	398
Unsafe Operation	22
Vehicle Equipment	27
Visitor Assist	79
Weapons Violation	9

Source: Grand Teton CIR reports

Emergency Medical Service Reports—GTNP

Emergency medical service (EMS) reports were compiled for five winter seasons from December through March 1995-2001 in GTNP and the Parkway. Frequently, the EMS reports do not list the type of activity victims were engaged in at the time of the incident. The activities and data in the following table reflect incidents involving winter recreationists and are limited to incidents that were reported to rangers and required EMS assistance. The analysis excludes EMS activities related to wheeled-vehicle traffic on US Highways 191/26/89.

Table 19. EMS reports by activity type from December-March 1995-2001.

Activity Type	Number of Persons Assisted	Percentage of Total
Not reported	18	69%
Snowmobile	7	27%
Snowcoach	1	4%

Source: Grand Teton EMS reports

Motor Vehicle Accidents—GTNP and the Parkway

Winter motor vehicle accidents (MVAs) were analyzed for five years from December through March 1995-2001

Vehicles

Not including the accidents that occurred on US Highways 191/26/89 south of Moran Junction in GTNP, there were 78 MVAs from December through March 1995-2001. Of those 78 MVAs, 69 (88%) involved wheeled-vehicles and 9 (12%) involved snowmobiles. The

accident statistics for GTNP and the Parkway show a greater percentage of the MVAs involving wheeled-vehicles than is the case for YNP.

Accident Descriptions

The types of MVAs for wheeled-vehicles in GTNP and the Parkway were:

- Vehicle versus vehicle—40%;
- Single vehicle accidents—39%;
- Vehicle versus animal (bison, elk, or moose)—17%; and,
- Vehicle versus snowmobile—4%.

The types of snowmobile accidents were:

- Lost control of snowmobile—29%;
- Snowmobile versus landscape feature (tree or lake)—29%;
- Snowmobile versus wheeled-vehicle—29%; and,
- Snowmobile versus snowmobile—14%.

Location

Wheeled vehicle accidents occurred most frequently from Colter Bay to Moran Junction (36%) and from Flagg Ranch to Colter Bay (23%). Most snowmobile accidents (89%) occurred between the South Entrance of YNP and Flagg Ranch.

Injuries

Most snowmobile MVAs in GTNP and the Parkway resulted in no injuries (87%). Visitors have expressed concern to park staff about safety on the Continental Divide Snowmobile Trail (CDST) in GTNP because of shared snowmobile and automobile use in US Highways 191/26/89. No fatalities have occurred on the CDST within GTNP or the Parkway.

Vehicle versus snowmobile accidents occurred mainly in the Flagg Ranch area. Causes for these accidents included traveling too fast for conditions, unsafe vehicle operation, and one accident occurred when a vehicle with a trailer attempted to swerve around a snowmobile.

Citations—GTNP and the Parkway

Statistics for citations issued to winter recreationists engaged in wheeled-vehicle touring and snowmobiling in GTNP and the Parkway were compiled for five winter seasons from December through March 1995-2001. There were no citations issued for recreationists involved in snowcoach touring.

Vehicles

Excluding those that occurred on US Highways 191/26/89, there were 299 citations issued in GTNP and the Parkway. Of those 299 citations, 230 (77%) involved wheeled-vehicles and 69 (23%) involved snowmobiles.

Incident Descriptions

Of the 69 citations issued to snowmobilers:

- 81% were issued for off-road travel or entering closed areas;
- 6% were issued for unsafe operation;
- 2% were issued for speeding;
- 2% were issued for allowing a driver to operate a snowmobile without a license;
- 5% were issued for traffic violations; and
- 6% were issued for unspecified offences.

Note: The total exceeds 100% due to rounding.

EMPLOYEE HEALTH AND SAFETY

Whether on duty or conducting personal business on their days off, employees living and working in the interior of the park are exposed to health and safety risks of winter use within YNP. In conducting routine tasks, employees can be regularly and recurrently exposed to the hazards of loud sounds, exhaust emissions, repetitive motions, spinal and musculature impacts from travelling extremely rough roads, avalanches, and sharing the roadway with inexperienced and unsafe snowmobilers. Reports from employees (NPS 2001), commercial guides (Carsley, pers. comm., 2001), OSHA (Occupational Safety and Health Administration 2001), and NIOSH (National Institute for Occupational Safety and Health 2001) have raised concerns about employee exposure to the hazards of working with the current mix of winter transportation in YNP. OSHA measured exposures in several work place environments over a single week in February 2000 (National Institute for Occupational Safety and Health 2001). They found high levels of noise, carbon monoxide, benzene, formaldehyde and severe shaking and vibration to employees riding snowmachines during the performance of their work duties. The NPS requires employees in the interior of YNP, as part of their duties, to be in the travel corridors. It is not an occasional, optional exposure for employees working in the interior of YNP.

Sound Emissions

Ranger complaints have cited that even while wearing hearing protection, the noise created by snowmobiling or being in close proximity to snowmobiles is intense (pers. comm. Dimmick,

Tyroler, and Webster). Employees have reported a constant ringing in the ears that directly correlated with time spent on and around 2-stroke snowmobiles. OSHA found that an employee working the express lane, primarily outside the kiosk booth at the West Entrance, was overexposed to noise during the admission of snowmobiles into the park. OSHA also found that a West District patrol ranger was overexposed to noise at a level of 93 decibels while conducting normal snowmobile patrol operations (Occupational Safety and Health Administration 2001). Patrol rangers always work outside the kiosks, and during busy periods entrance staff must leave the kiosks to effectively keep the traffic flowing.

Air Emissions

Air monitoring near the West Entrance has shown significant levels of carbon monoxide, particulates, nitrates of oxides, hydrocarbons, benzene, formaldehyde and other by-products of the internal combustion engine. Concentrations of these pollutants increase during periods of high visitation and/or poor air movement. When air is stagnant, employees working and traveling in or near the primary travel corridors are exposed to these emissions. Complaints of nausea, dizziness, headaches, sore throats, eye irritation, light-headedness, and lethargy are frequent among employees who work at the West Entrance and others who work within the more heavily used travel corridors. OSHA found that an employee working the express lane, primarily outside the kiosk booth at the West Entrance, was overexposed to benzene and formaldehyde, both known carcinogens, as an 8-hour time-weighted average and overexposed to carbon monoxide as a peak concentration (Occupational Safety and Health Administration 2001).

Repetitive Motion Injuries

High traffic volume and/or warm weather, especially on the Old Faithful to West Entrance route, results in the formation of moguls (road bumps) in the groomed, snow-covered road surface. The NPS grooms nightly; however, warm weather, low snowfall, and/or high numbers of oversnow vehicles quickly return the bumpy snow surface to the road. Patrolling and travelling in the park when the roads are rough, particularly Old Faithful to West Entrance, daily for up to 10 hours per day for the duration of the winter season results in the park rangers, maintenance personnel, and commercial guides experiencing trauma to their bodies while performing their jobs. The jarring of riding a snowmobile or driving a snowcoach in these conditions have led to frequent reports of back, arm, and hand injury, pain and/or numbness. NIOSH recommended that either the most heavily used roads in the park be groomed more frequently or that the number of snowmobiles allowed in the park be reduced

to maintain the smoothest roads possible to minimize shocks and jolts (National Institute for Occupational Safety and Health 2001).

Some workers had hand tremor and decreased hand coordination related to snowmobile use (National Institute for Occupational Safety and Health 2001). Employees have reported the need for and have received medical treatment for tendonitis in the wrist and hand pain and numbness (NPS 2001).

Avalanches

Avalanche control is a high-risk operation. NPS staff conduct avalanche control operations on both the South Entrance and East Entrance roads. OSHA identified eight hazards of the park's avalanche control operation for Sylvan Pass on the East Entrance road (Occupational Safety and Health Administration 2001). The eight hazards identified by OSHA are as follows.

- Falling ice cornices: The reverberation of muzzle blasts can cause the ice cornices that hang on the slopes above the gun crew to break loose.
- Falling rocks as weathered rock above the gun crew regularly fractures and breaks.
- Avalanche and snow slides: Groomers and employees on snowmobiles from Lake must pass three target avalanche areas to get to the gun site before they can begin to take mitigation action. Employees who come from the East Entrance must pass 20 target areas to get to the gun site.
- Cold stress and hypothermia: after snowmobiling 20 miles to Sylvan pass, employees from Lake spend three to five hours at the gun site and then snowmobile back.
- Slipping or falling while handling explosives. Employees carry the cartridges to and from the gun site over ice and snow-covered pathways.
- Inadequate communication from Sylvan Pass and areas east of the pass in the event of an emergency.
- Lack of emergency first aid provisions and an emergency plan.
- Back strain or sprain hazards from moving 108-pound ammunition crates.

Most of these hazards occur on the East Entrance road. Here, park staff is being exposed to very significant avalanche hazards to keep a segment of road open that serves only 3% of YNP's winter visitation. YNP has taken steps to partly mitigate these hazards. A barrier and trench behind the gun platform have been constructed; however, neither was engineered for a worst-case scenario (they were the best efforts made with available resources and knowledge). A military-style bunker or gun placement similar to those used to protect beachheads in World War II would offer the greatest protection for gun, crew, and equipment. The bunker has not been constructed nor funded. A warming building at the gun site and an ambulance on Mattracks, accompanying the avalanche crew during each control operation, provide relief from the cold. Beginning in the 2001-2002 winter season, the park's policy states that

avalanche control will only be performed when conditions warrant and are not extreme. Additionally, a permanent repeater was installed on Top Notch Peak this fall to improve communications. To provide emergency care, first aid equipment will be placed in the ambulance on Mattracks, which, along with First Responder qualified personnel, will be a part of each mission. To address back strain and sprain hazards, an advisory has been restated, requiring all ammunition crates to be handled by two people.

Other Snowmobilers' Behavior

Concerns about personal safety result from frequently witnessing unsafe driving by other snowmobilers. Speeding, riding on the wrong side of the road, improper passing, and traveling 2-3 abreast covering both lanes of traffic cause trepidation to employees as they travel the park roads by snowmobiles. Infractions, such as these, often receive citations and hundreds more receive verbal warnings, yet these types of violations continue to occur daily and with high frequency. A survey conducted in 1997 showed that more than 75% of visitors feel unsafe travel behavior of other visitors is important, and 31% said that it detracted from their experience (Borrie and Freimund 1997). Similar concerns by employees are documented in anecdotal reports.

WILDLIFE – ELK AND BISON

The following sections describe the species that are of concern within the scope of this SEIS, bison and elk. These descriptions summarize information provided in the FEIS, hereby incorporated by reference (see pages 143-149 of that document). A review of recent publications available subsequent to the publication of the FEIS is provided in a separate section following this summary. To clarify terms used in this document that pertain to the effects of oversnow motorized use on wildlife, the following definitions are provided and are based on park regulations and policies.

Conflict: a situation resulting from opposing desires or needs. The human desire to recreate in ungulate winter range versus an animal's need to obtain and conserve energy often results in conflict.

Harassment: the act of exhausting, fatiguing, or persistently annoying wildlife. Oversnow motorized use in ungulate winter range can cause harassment of ungulates on or near motorized routes. The word harassment is commonly used in the literature to describe the effects of human activities on wildlife (Canfield et al. 1999).

Disturbance: to interfere with, or destroy the tranquility or composure of wildlife. All of the effects described as associated with oversnow motorized use may be broadly referred to as disturbances.

Wintering wildlife in the GYA are challenged for survival. High snow depths, cold temperatures, and lack of high quality forage can lead to synergistic and nutritional stress, and, consequently, higher rates of competition and mortality. Human activities in the winter may serve to compound these factors. Information pertinent to the scope of this analysis revolves around the location of winter range and winter energy budgets for animals as they may be affected by oversnow motorized use.

Because many of the groomed roadways in YNP bisect ungulate winter range, interactions between elk, bison, and oversnow motorized vehicles are common. Rangers are frequently dispatched to the scene of wildlife-visitor conflicts to direct traffic and to ensure the safety of both visitors and wildlife. Because many of these incidents are not documented in case incident reports, rangers were asked to provide narrative accounts on their experiences dealing with oversnow motorized use and wildlife in YNP.

Of the nine rangers who provided written accounts, all emphasized the frequent, often daily, occurrence of conflicts among ungulates (primarily bison) and oversnow motorized use, particularly snowmobiles. The most commonly cited problems involved snowmobilers unsafely passing bison. As snowmobilers attempt to pass through herds of bison, the animals often bolt and run, and as a consequence are “herded” down the road until they are pushed off the roadway. The experience is especially difficult for the animals when snow berms are high or they are forced into deep soft snow. Another commonly observed situation occurs when snowmobiles drive into the middle of a group of bison, thus aggravating the group and increasing the danger from running animals that have no where to go. According to one ranger, many of the snowmobilers that are cited for off-road violations claim that they left the road in an attempt to evade or otherwise go around bison. Rangers noted that these and other unsafe and harassing behaviors occur despite the availability of safety information that includes recommendations for interacting with animals on the roadway. They attributed these behaviors largely to inexperienced snowmobilers and snowmobilers who lack the patience to wait for animals to cross or exit the roadway.

In addition, poor lighting conditions and weather exacerbate all of the above conflicts, with bison sometimes resting on the roads at these times. Several nighttime collisions involving bison and snowmobilers resulted in severe injuries and two fatalities, and the bison in

question had to be dispatched by rangers. In conclusion, although harassment is not the intent of most interactions, the juxtaposition of heavily used groomed motorized routes and ungulate winter range renders it virtually inevitable along some road segments.

To obtain site-specific information on particular road segments, YNP rangers and other park employees were surveyed¹¹ as to the type of interactions they've encountered, the frequency of such interactions, and the time of day and month that most interactions occurred. As required by NEPA, these anecdotal observations represent the best available site specific information and are viewed by NPS as a useful means to characterize situations commonly encountered along park roads in the winter. This information is used to supplement existing analyses presented in this document and the FEIS; data obtained from this survey does not alter the original determination of effects. Its purpose is to provide ancillary information on the frequency and location of the identified impacts.

This survey was criticized by the cooperating agencies as being unscientific and biased. NPS asserts that this information was solicited in part to respond to the agencies' contention that adverse effects to wildlife as a result of oversnow motorized use in the parks are based on conjecture and are unsubstantiated. The agencies object to findings in the FEIS that concluded that such effects exist and point to the lack of support for these findings in the scientific literature. While it is true that the literature does not contain conclusive evidence that oversnow motorized use is adversely affecting ungulate populations in the parks, it does acknowledge several important factors: the extreme challenges wildlife species face in severe winter environments; the high importance of winter ranges as refugia; and describes the effects that human activities cause when superimposed on these ranges (see FEIS, pages 237-241). Even though Knight and Cole (1995) acknowledged that the understanding of how recreation affects wildlife is disparate and seldom definitive, they point to preliminary evidence that suggests recreation can harm wildlife. They also referenced a review of pertinent literature revealing that most studies document immediate, short term responses of individuals rather than long term responses by populations when disturbed by recreational activities (Boyle and Sampson 1985). According to Canfield et al. (1999), responses of ungulates to recreation activities on winter ranges vary from apparent disinterest to flight, but every response has a cost in energy consumption. For example, even when disturbances do not result in overt responses (e.g., fleeing), relatively high energy expenditures caused by

¹¹ Approximately 60 total employees were polled. These employees were chosen because they regularly travel the park roads and have worked in the park for multiple winter seasons. In addition, many of these employees also live in the interior of the park in the winter time.

increased heart rates have been confirmed for a variety of ungulate species. Both Aune (1981) and Cole (1978) noted that ungulates were displaced from areas immediately adjacent to snowmobile routes in YNP, and Aune stated that recreational activity increased energy expenditures and reported that the most significant expenditures occurred during interactions along groomed snowmobile routes.¹² Although Aune concluded that population level effects were not evident, he noted that the snowmobile route from West Yellowstone to Old Faithful, because it passes through core winter range, posed a serious problem to wintering ungulates. Therefore he recommended the trail either be rerouted, that use limits be imposed and use redistributed to other less critical areas of the park, or that snowmobile use be restricted to guided tours led by a qualified naturalist. Caslick (1997), also concerned about the juxtaposition of heavily used oversnow motorized routes and critical winter range in YNP, recommended that intensive winter energetics research be conducted to further define the magnitude with which winter recreation negatively affects winter-stressed wildlife in YNP. He considered snowmobiling in thermally influenced wildlife ranges in YNP to be the most pressing visitor use management issue in YNP, and noted that snowmobiling has been reported to impact ungulates outside of the park in Montana and Wyoming. He concludes that “there is no apparent reason to expect that similar effects would not occur in YNP, where winter conditions are generally more severe and the intensity of snowmobile use is generally higher...”.

NPS concurs with the above literature reviews, and maintains, as concluded in the FEIS and ROD, that there are indeed effects to wildlife from oversnow motorized use, and that these effects are adverse. The parks were established, in part, to provide areas of security for wildlife. Population level effects do not need to be indisputably proven in order for the parks to make a determination that adverse effects to animals are occurring as a consequence of oversnow motorized use in critical ungulate winter range.

For many park values, including wildlife, “objective” scientifically driven standards or definitions for what constitutes an adverse effect do not exist and are not quantifiable. The role of scientific research in the field of wildlife behavior is, to paraphrase Whittaker and Knight (1999), to provide management with information on wildlife responses to human activities. The role of management is to develop appropriate standards or ideals that define what is acceptable for a given area or activity. Clearly, park regulations, policies, and

¹² Ungulates were reported to habituate to recreational activity as the winter progressed, possibly due to the progressively weakening condition of the animals coupled with increasing snow depth. NPS maintains that habituation is not a desired condition for wild animals in the parks.

enabling legislation intend for the parks to have high standards and to have the discretion upon which to judge whether or not these standards are met.¹³ Service-wide regulations prohibit snowmobile use that “disturbs wildlife” (36 CFR 2.18). Therefore, NPS does not have the authority to allow snowmobile use where disturbance occurs. The purpose of the analysis of impacts to wildlife is to determine whether or not current snowmobile use violates this regulation (see Chapter IV of this document for the effects analysis by alternative). As stated above, the survey in question was used to characterize the type, location, and frequency of conflicts related to wildlife and oversnow motorized use in YNP, and to hypothesize, by alternative, where risks to wildlife were more likely to occur. This type of assessment assists not only in identifying areas of highest concern, but also in analyzing the potential effectiveness of mitigation measures and alternative features.

Survey Results

Twenty employees responded. On average, they spend approximately 46% of their time on park roads, and have worked an average of 7.5 winters in YNP. Respondents were asked to categorize road segments using the following types of documented conflicts:

1. animals herded down the road;
2. animals prevented from crossing the road;
3. visitors deliberately approached closer than necessary to provoke a response for photos or amusement;
4. collisions that did not result in known mortality (information related to road killed animals was obtained from park files);
5. activities caused animals to flee;
6. activities caused an animal to attack or threaten visitors;
7. activities that elicited responses that did not include fleeing but were obviously disturbing (e.g., animal was too weak to leave roadway but was clearly stressed; describe these interactions); and
8. no conflicts observed .

Based on their responses, road segments were ranked based on how many respondents observed conflicts on a particular segment and the perceived frequency of the conflicts (how many per day, week, or month; Table 20). All but one respondent reported observing conflicts. Of the remaining 19 employees who did report conflicts, 10 reported that both snowmobiles and snowcoaches were involved; the remaining nine employees cited snowmobiles as the sole cause of the conflict. The road segments with the heaviest levels of traffic were also ranked among the highest in terms of conflicts with wildlife. Over all road

¹³ Issues related to assessing the effects of winter use on wildlife are addressed under the adaptive management provision of each alternative. NPS proposes standards in this document based on an interpretation of park policies, EOs, and laws. Using appropriate methodology, impacts will be assessed as to whether or not they meet these standards. Outcomes include the formulation of new management actions or a revision of the standards themselves based on their ability to detect change.

segments, the most observed conflicts occurred primarily between 8:00 a.m. and noon during January and February, and the most frequent conflict reported was the herding of animals down the roadway.

A study was initiated during the winter of 2001-02 in YNP to obtain additional information on the types and frequency of wildlife-visitor interactions associated with the groomed roads from West Yellowstone to Old Faithful. Biologists travel the groomed routes daily and record all wildlife observations on and near park winter roads. Information on wildlife species, location, time of day, group size, and distance from the nearest road is collected. They also record visitor activity, classify wildlife responses, and document wildlife-visitor interactions using digital photography. Results of the first year of this study will be reported in the FEIS.

Ungulate Winter Ranges

Ungulates rely on restricted winter ranges in which food and cover may be limited. Major episodes of winter stress, low forage availability, and declining physiological conditions lead to increases in mortality (Meagher 1998). Competition is particularly severe in winter, when thousands of large ungulates move to lower valley elevations to forage on exposed vegetation in areas of low snow depth (Clark 1999). Concern over the loss of elk winter range in Jackson Hole resulted in the creation of the National Elk Refuge in 1912, to which a great many elk now migrate before the winter recreation season begins. Moose migrate from higher elevations in and surrounding GTNP to the valley floors and canyon mouths where snow depths are lower.

Table 20. Road segments and related wildlife conflicts in YNP. Based on an employee survey of observed interactions.

Road Segments: Ranked by number of reported conflicts from high to low	Overall frequency of conflicts	Time most conflicts occurred	Most frequent conflict reported	Second most frequent conflict reported	Third most frequent conflict reported	Month most conflicts were observed
1. West Entrance to Madison	> than 5 per day	8:00 a.m. - noon	Animals herded down the roadway	Animals prevented from crossing the road	Visitors deliberately approaching animals ¹⁴	February
2. Madison to Old Faithful	Respondents split evenly: 3-5 per day and > 5 per day	8:00 a.m. - noon	Animals prevented from crossing the road	Animals herded down the roadway	Visitors deliberately approaching animals	February
3. Old Faithful to West Thumb	> 5 per day	12:00-5:00 p.m.	Visitors deliberately approaching animals to provoke a response (Tie)	Activities cause animals to flee (Tie)	Animals prevented from crossing the road	December
4. Fishing Bridge to East Entrance	3-5 per day	Primarily < 8:00 am and from 5:00 p.m. to 7:00 p.m.	Animals herded down the roadway	Activities cause animals to flee	Animals prevented from crossing the road	January
5. Canyon Village to Fishing Bridge	Respondents split evenly: 3-5 per week and 1-2 per month	12:00-5:00 p.m.	Animals herded down the roadway	Visitors deliberately approaching animals to provoke a response	Animals prevented from crossing the road	January
6. Madison to Norris	1-2 per month	8:00 a.m. - noon	Animals herded down the roadway	Animals prevented from crossing the road	Visitors deliberately approaching animals	January and February - tied

¹⁴ Refers to instances where visitors approach closer than necessary for photos or amusement purposes.

Road Segments: Ranked by number of reported conflicts from high to low	Overall frequency of conflicts	Time most conflicts occurred	Most frequent conflict reported	Second most frequent conflict reported	Third most frequent conflict reported	Month most conflicts were observed
7. Mammoth to Norris	1-2 per month	8:00 a.m. - noon	Animals herded down the roadway	Activities cause animals to flee	Animals prevented from crossing the road	January
8. West Thumb to Flagg	1-2 per month	8:00 a.m. - noon	Activities cause animals to flee	Animals prevented from crossing the road (Tie)	Visitors deliberately approaching animals (Tie)	February
9. Fishing Bridge to West Thumb	1-2 per month	12:00-5:00 p.m.	Animals herded down the roadway (Tie)	Animals prevented from crossing the road (Tie)	Visitors deliberately approaching animals	December , January, and February - all tied
10. Norris to Canyon¹⁵	3-5 per month	8:00 a.m. - noon	Animals herded down the roadway	Animals prevented from crossing the road	Visitors deliberately approaching animals	January and February - equal

In YNP, thermal areas are important components of winter range because warm ground keeps these areas relatively free of snow, enabling bison and other ungulates to feed in the otherwise snowbound interior of the park (Meagher 1970, 1971, 1976, 1978, 1985, 1998; Murie 1940; Miller 1968; Craighead et al. 1973; Ables and Ables 1987; NPS 1990). During severe winters, valleys supporting bison have either extensive thermal or warm areas, or many small thermal areas among which bison movement is possible. Streams that remain unfrozen because of an influx of warm water are an additional feature of most wintering areas of bison in YNP. Meagher (1978) wrote “Scattered thermal sites—particularly warm ground with less snow—apparently provide a margin for survival for bison in the harshest wintering areas of YNP.” During four aerial counts of bison in Hayden and Pelican Valleys in winter 1997-1998 (December through March), bison were usually located in or near thermal areas and along the banks of thermally influenced streams (Kurz 1998). As reported

¹⁵ Low rank because only two respondents reported conflicts along this route.

in a number of studies since 1973, thermal areas with snow-free vegetation or shallow snow are also very important winter habitats for elk along the Madison, Firehole, and Gibbon Rivers (NPS 1990).

Ungulate Energy Budgets

Ungulates function at an energy deficit during winter because snow reduces forage availability, affects an animal's ability to escape predators, and increases energy costs at a period of time when the nutritional value of winter forage is low (Beall 1974; Skovlin 1982; Mattfield 1974; Parker et al. 1984). Energy costs, expressed in calories expended per unit of time for various activities, must be balanced by energy intake from foods that provide necessary proteins, fats, and carbohydrates. Malnutrition may cause mortality directly, or increase the risk of death by disease or predation.

Deep snow greatly increases the amounts of energy expended by elk for locomotion in YNP and elsewhere (Parker et al. 1984, Telfer 1978). DelGuidice et al. (1991) found severe energy deprivation of elk in YNP to be associated with increased elk density or deep snow cover. Elk feeding in thermal areas and snow-free areas near warm springs fed an average of about 11 hours per day; in comparison Coughenour (1994) estimated that elk in snow (up to 60 cm deep) may require 16 hours of feeding per day to meet their energy requirements.

Aune (1981) described bison movements as appearing to be less restricted by snow than were elk movements. Bison primarily used a network of well-established trails and travel routes, including riparian areas. Bison do use groomed and plowed roads, but use is considered minor compared to off-road travel (Bjornlie 2000, Kurz et al. 2000; see FEIS Chapter 4, alternative A). All of these strategies help to reduce energy expenditures to some degree, and consequently, enhance their over-winter survival. Severe winter conditions are a main cause of bison mortality. Bison die during major episodes of winter stress, low forage availability, and declining physiological conditions (NPS 1998).

Federally Protected Species

The Endangered Species Act requires an examination of impacts on all federally threatened or endangered species. The affected environment description for these species occurs in the FEIS on pages 150-55, and greater detail may be found in the Biological Assessment associated with that document. These materials are incorporated by reference. Federally protected species were dismissed from the SEIS at the beginning of Chapter III.

Recent Publications

Winter Bison Monitoring – 2001 Annual Report

This report¹⁶ by YNP staff describes a multi-year monitoring effort on bison use of winter roads. It relates use of roads by bison to measured weather variables such as average snow depth and temperature, and correlates the number of bison observed on roads to their activity (feeding, resting, traveling), habitat, location, time of year, and survey method. In the conclusion, it is noted that bison use of groomed roads comprises a relatively small portion of their time in winter. Nonetheless, it is acknowledged that longer term studies of bison movements, distribution and population dynamics indicate that bison use of groomed roads may have shifted the cumulative energetics of bison behavior, movement patterns and survival of winter groups within YNP. Despite the relative ease with which bison may travel on groomed roads, the added stress upon bison from close proximity to snowmobiles, snowcoaches and winter park visitors may offset any energy gains that contribute to winter survival. This discussion is entirely consistent with the disclosure of effects on bison in the FEIS. Because the current effort to monitor bison does not attempt to collect data about bison behavior in relation to human use of roads, this report did not contribute additional information useful in this analysis.

Snowmobile Activity and Glucocorticoid Stress Responses in Wolves and Elk

This report¹⁷ documents the use of fecal glucocorticoid (FGC) levels to measure physiological stress in wolves and elk. FGC levels were tested in several national parks, including Yellowstone, where snowmobiling is a popular activity. The report indicates that higher FGC levels were found in wolves in areas and times of heavy snowmobile use, and for elk, day-to-day variations in FGC levels paralleled variations in the number of snowmobiles; i.e., higher numbers of snowmobiles produce higher amounts of FGC indicating higher stress levels. The study reported higher FGC response to snowmobiles than to wheeled vehicles. Nonetheless, the authors note that despite measured stress responses, there is no evidence that current levels of snowmobile activity are affecting population dynamics for either wolves or elk. As with the bison monitoring report, this assessment is entirely consistent with the disclosure of impacts in the FEIS. Although the FEIS documents no impacts at the population level for wolves or elk, it does disclose

¹⁶ Reinertson, Reinhart, and Kurz. May 11, 2001

¹⁷ Creel, S., J.E. Fox, A. Hardy, J. Sands, B. Garrott, and R.O. Peterson. In Press. Conservation Biology.

disturbance to *individual* animals from winter recreation, including displacement and behavioral responses.¹⁸

In conclusion, the authors note an interpretive dilemma. They acknowledge that at one extreme, one could argue that in the absence of an effect on population size, human activities may be considered benign or acceptable. At the other extreme, one could argue that human activities inducing physiological stress responses should be curtailed, considering the large body of research which shows that prolonged and elevated FGC levels reduce survival and reproduction.

Bison and Elk Responses to Winter Recreation in Yellowstone National Park

This thesis by Amanda Hardy of Montana State University presents the results of research that examined the effects of winter recreation on elk and bison abundance, distribution, behavior, and stress hormone levels in the upper Madison River drainage of YNP. Several factors were examined: human activity levels; human-ungulate interactions; elk and bison distribution patterns in relation to the road corridor and areas of human activity; and elk and bison fecal glucocorticoid (FGC) levels as a physiological index of stress. Using these data, models were run to test if daily and cumulative numbers of vehicles entering the study area or types of winter recreation activities and human behaviors contributed significantly to elk and bison distribution, behavior, and stress hormone responses. In addition, elk and bison behaviors and numbers were compared to a study conducted 20 years ago when winter visitation was considerably less than it is currently (Aune 1981).

To summarize, while close proximity of any human activity invoked negative responses, bison and elk appeared to habituate as exposure to traffic increased throughout the winter recreation season. When comparing responses between wheeled vehicle activity and oversnow vehicle activity, no difference was found in bison and elk behavior or distribution. Levels of FGCs were, however, higher in bison and elk during periods of wheeled vehicle travel, with FGC levels in elk increasing as traffic entering the West Yellowstone gate exceeded 7,500 cumulative vehicles subsequent to the spring opening of the roads in late April. Elk along the more heavily used West Yellowstone to Old Faithful route were also more behaviorally sensitive compared to elk observed between Madison and Norris, with elk increasing their distance from all roads as increasing numbers of vehicles entered the West

¹⁸ The State of Wyoming submits that for a population that is already "over target" in the GYA [presumably elk - ed], one could argue that this is a positive management action. NPS does not agree with this position. Populations of elk, bison and other wildlife within the park are regarded under law as park resources and values to be protected. Herd numbers or targets of hunted populations do not apply in the park.

Yellowstone gate. Overall, off-trail travel (skiers, snowshoers) induced the most behavioral responses in both species.¹⁹

The author concluded that winter recreation in YNP is co-existing with bison and elk without causing declines in population levels, and that continued use of traditional winter range remains essentially unchanged despite a substantial increase in winter visitation. However, the fact that elk FGC levels increased with increasing amounts of traffic indicates that nonobservable responses do occur and may contribute to chronic stress. Chronic stress may affect resistance to disease and survival, and may inhibit reproductive potential. Despite the potential for deleterious effects, elk and bison populations in the Madison River drainage appear stable to increasing at this time.

While the disclosure of impacts to ungulates in the FEIS does not specifically include a discussion of FGC levels as an indicator of stress, the overall conclusions are similar: oversnow motorized access to the parks does not appear to be resulting in long term effects to populations of elk and bison. Nonetheless, harassment and displacement of *individuals* is evident, and remains a stated concern.

NATURAL SOUNDSCAPES

Discussion of the natural soundscape may be found on FEIS pages 158-171. The FEIS introduces analysis by explaining sound levels, sound level changes and audibility. It explains natural and human-generated winter sound sources, and current sound levels relating to oversnow vehicles. A great deal of information is provided on measurement of ambient sound levels and human-generated sound at eight monitoring sites in the three parks units. This information, incorporated by reference into this SEIS, is briefly summarized here. A report was prepared to document the analysis of sound and impacts on the natural soundscape in the FEIS: *Technical Report on Noise: Winter Use Plan Final Environmental Impact Statement* (Harris, Miller, Miller and Hanson, Inc., June 2001).

An important part of the mission of the NPS is to preserve or restore the natural soundscapes associated with units of the national park system. The natural soundscapes (also referred to as natural quiet and the natural ambient sound level) are the unimpaired sounds of nature, and are among the intrinsic elements of the environment that are associated both with the purpose of a park and with its natural ecological functioning. They are inherent components

¹⁹ The effects of nonmotorized use on wildlife are disclosed in the FEIS and are incorporated by reference.

of "the scenery and the natural and historic objects and the wildlife" protected by the NPS Organic Act. Natural sounds and tranquility are major resources of many national parks and are valued by visitors. Increasingly, even parks that appear as they did in historical context do not sound like they once did. Natural sounds are being masked or obscured by a wide variety of human activities. NPS policy is to facilitate, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate noise sources. Every visitor who so desires should have the opportunity to enjoy natural soundscapes and to hear the sounds of nature without impairment.

The existing winter sound environment in each park is a combination, in varying degrees, of natural and human-generated sounds. During winter months some significant natural sound sources present in other seasons are not present in either GTNP or YNP. These sounds include the rustling of leaves of deciduous trees, birds, insects and animals, and, to a lesser extent, waterfall and stream sounds. In the winter months, water flow in streams and rivers is lower than during the spring and summer, and ice covering the streams reduces emitted sound levels. Generally, winter background natural sounds are limited to wind, wind-rustled coniferous trees, muffled streams, waterfalls, and animals. In YNP, the unique natural sound of thermal activity associated with hotpots and geysers are notable. Because of the differences in natural sources, background sound levels in wilderness or national park areas have been measured as lower during the winter than during the other seasons (Gdula 1998, Foch 1999).

Human-generated intrusions include snowmobiles and snowcoaches that travel along designated groomed and ungroomed routes in both YNP and GTNP, as well as snowplanes that are used by ice fishers on Jackson Lake in GTNP. Human-generated intrusions also include wheeled vehicles on plowed roads in GTNP and along the Parkway road, such as passenger vehicles that are often pulling snowmobile trailers, and occasional plow and supply trucks. A limited number of diesel buses also travel to Flagg Ranch for snowcoach tours into YNP. Other intrusions are the more localized sounds of cross-country skiing, winter camping, lodging and human voices. Also, aircraft overflights occur over both parks. These consist of high altitude commercial overflights, regular traffic at GTNP associated with Jackson Hole Airport, occasional NPS flights for research or other park purposes, and occasional private or charter flights.

Areas of primary concern for this analysis, relative to natural soundscapes, are those where mechanized noise from wheeled or oversnow vehicles on plowed, groomed or ungroomed motorized trails and routes affects the natural soundscape within the parks. For purposes of this analysis, the existing noise environment is described in terms of the proximity to these trails and routes.

Four studies were drawn upon to describe the existing natural background and human-generated sound levels in YNP and GTNP. Three were done in 1994-1996 by Bowlby & Associates, Inc., as part of a study of the Continental Divide Snowmobile Trail (CDST); they examined the sound levels of wheeled vehicles, snowmobiles, and snowplanes in GTNP, along the Parkway road heading up to Flagg Ranch, and in the southernmost part of YNP. Some short term samples of background sound level data were also collected (Bowlby & Associates 1994; 1995; and 1996). The fourth study, by Harris Miller Miller & Hanson Inc., and Bowlby & Associates, Inc., was conducted in February and March 2000 specifically with two purposes: (1) measuring background sound levels in YNP and GTNP, and (2) assessing the noise impact of man-made sounds, including snowmobiles, snowcoaches, snowplanes, automobiles, buses and aircraft for the alternatives in the EIS (Harris Miller Miller & Hanson 2000), Bowlby & Associates 2000). Results of studies are reported in detail in the FEIS.

VISITOR ACCESS AND CIRCULATION

Discussion of winter visitor access and circulation may be found in the FEIS on pages 175-184. The FEIS describes regional access to each park unit, which amounts to listing interstate highways and gateway communities. The FEIS enumerates roadways and motorized trails within each park unit, and describes available services and attractions associated with each road segment. Park facilities and winter destination areas are also described, with particulars given in the areas of lodging and parking. This information, incorporated by reference into this SEIS, is briefly summarized here.

Five gateway communities and park entrance stations serve as local access to YNP. U.S. Highway 89 through Gardiner, Montana serves the North Entrance Station, 54 miles south of Livingston, Montana. The Northeast Entrance Station provides direct park access from Silver Gate, Cooke City, Red Lodge, and Billings, Montana via U.S. Highway 212. The East Entrance Station connects the park to Cody, Wyoming by U.S. Highway 16, 53 miles east of the park. The Parkway (U.S. Highway 89/287) provides access from the south. U.S. Highways 20 and 287 serve access to the West Entrance Station, through West Yellowstone.

Regional access to the Parkway is provided via U.S. Highway 287 from the Moran Entrance to GTNP on the east, and U.S. Highway 89 on the south from Jackson, Wyoming through GTNP. GTNP administers the Parkway. Interstate 15 on the western edge of the region provides access to the park from Idaho Falls, Pocatello, and Boise, Idaho. Interstate 80 serves as a major east-west connection for visitors entering the park from the south. The primary gateway community for GTNP is Jackson, Wyoming, located about 3 miles south of the park boundary on U.S. Highway 89. Dubois, Wyoming, about 50 miles east of Moran along U.S. Highway 26/28, is a full service community through which all travel from the east must proceed, and through which people can access YNP, GTNP and the Parkway as an alternative to traveling through Jackson. The northern access route, U.S. Highway 89/287, is closed in the winter to wheeled vehicles north of Flagg Ranch through YNP.

YNP roads are maintained for many purposes including touring and sightseeing, accessing trailheads, and park management. During the winter, all park roads are closed to wheeled vehicular traffic with the exception of Highway 191, which provides access between West Yellowstone and I-90 near Bozeman, Montana, and the road from Mammoth to Tower and Tower to the Northeast Entrance Station (Cooke City). These two roads provide the only regional access through the park during the winter.

Visitors reach most park features via snowmobiles, snowcoaches, and cross-country skis. Staging areas, or points of access, for oversnow routes into the park are important components of the winter visitor experience. They typically include a parking area with appropriate signing and may have restrooms, a warming hut, and snowmobile rental facilities. Snowcoach routes offered by concessionaires provide access to the park from some staging areas. The staging areas for trips into YNP are near Mammoth Hot Springs in the north, at Pahaska Teepee in the Shoshone National Forest near the East Entrance, at a parking area just north of Flagg Ranch near the South Entrance, and in the city of West Yellowstone near the West Entrance. These staging areas become congested during peak days because of small or undefined parking and unloading areas. Many difficulties exist in serving winter visitors, including a shortage of all-weather facilities and the dangers of exposure to subzero temperatures.

YNP, GTNP and Parkway transportation segments are tabulated below. Each segment, and features associated with it, is described in the FEIS.

Table 21. Winter travel segments in the three park units.

Segment/ Area	Description	Length (miles)
Canyon Village to Norris Junction	Groomed snow road	13.1
Mammoth Hot Springs to Norris Junction	Groomed snow road	22.6
Mammoth Hot Springs to North Entrance	Plowed route	4.8
Mammoth Hot Springs to Tower Junction	Plowed route	18.5
Tower Junction to Northeast Entrance Station	Plowed route	32.7
Tower Junction to Canyon Village	Closed to motorized use	18.2
Canyon Village to Fishing Bridge	Groomed snow road	15.7
Fishing Bridge to East Entrance:	Groomed snow road	25.4
Fishing Bridge to West Thumb	Groomed snow road	20.0
West Thumb to South Entrance	Groomed snow road	22.0
West Thumb to Old Faithful	Groomed snow road	17.8
Old Faithful to Madison Junction:	Groomed snow road	16.6
Madison Junction to West Entrance	Groomed snow road	13.7
Madison Junction to Norris Geyser Basin:	Groomed snow road	13.7
YNP South Entrance to Flagg Ranch	Groomed snow road	2.0
Flagg Ranch to Parkway west boundary (Grassy Lake Rd)	Groomed snow road	7.6
Flagg Ranch to Colter Bay	Plowed highway, adjacent groomed route	15.6
Colter Bay to Moran Junction	Plowed highway, adjacent groomed route	10.2
Moran Junction to east GTNP entrance	Plowed highway, adjacent groomed route	2.0
Moran Junction to south GTNP entrance	Plowed highway	26.0
Teton Park Road	Nonmotorized route	15.0
Gros Ventre Road	Plowed road	13.0
Moose-Wilson Road:	Plowed road from both ends, 1.5 mi. non motorized	7.0
Jackson Lake	area closed to snowplanes	N/A

The Parkway encompasses 24,000 acres between YNP and GTNP, and is also a roadway through GTNP. It provides access to Flagg Ranch, which serves as a principal winter use staging area. The roadway itself is about 7.5 miles through the Parkway, between the South

Entrance to YNP and the northern edge of GTNP. The road is groomed between Flagg Ranch and YNP and is plowed south of Flagg Ranch to GTNP. The CDST parallels the road between the eastern boundary of GTNP and Flagg Ranch, and is accessed from trail systems on the adjacent Shoshone and Bridger-Teton National Forests out of Jackson and Dubois. Grassy Lake Road, beginning at Flagg Ranch and continuing west outside the Parkway boundary into Targhee National Forest is groomed in the winter for oversnow travel.

Winter lodging facilities in YNP provide a total of 256 rooms with 413 beds in two lodging facilities: Mammoth Hot Springs Hotel and cabins, and Old Faithful Snow Lodge and cabins. In addition to these facilities, Yellowstone Expedition operates a system of yurts near Canyon Village. The park also issues winter backcountry camping permits.

Warming huts in YNP are located at Mammoth, Canyon Village, Indian Creek, Fishing Bridge, Madison, Old Faithful, and West Thumb. A new warming hut has been approved and is planned for Norris, while the Canyon Village, Old Faithful and Madison warming huts are scheduled for replacement. Warming huts at Mammoth, Madison, and Canyon Village locations are staffed by concession personnel who operate small snack bars and maintain vending machines. NPS interpreters, who answer questions and provide information and various forms of assistance to visitors, also staff some of the huts. Snowcoach tours operate from Mammoth Hot Springs, Old Faithful, West Yellowstone and Flagg Ranch (the Parkway). Snowcoaches provide cross-country skiing tours, snowshoe tours, and sightseeing tours.

For GTNP and the Parkway, Flagg Ranch and Triangle X are permitted by NPS to provide overnight accommodations during the winter. Signal Mountain, Colter Bay and Jackson Lake lodge facilities are closed for winter use. Flagg Ranch is the major staging area for oversnow travel from the south to YNP. Dornan's, a park inholder at Moose Junction, is open year-round and offers dining, general store, gas, and visitor information in the winter months. Park Headquarters and the Moose Visitor Center, located across the Snake River just west of Moose Junction, are open in the winter.

WINTER VISITOR USE

Discussion of winter visitor use may be found in the FEIS on pages 184-190 and is hereby incorporated by reference. Updated statistics for the winter season of 2000-01 are included in this document. Winter activity at YNP is composed primarily of visitors on snowmobiles (62%), automobiles and bus passengers (29%), snowcoach passengers (9%), and cross-

country skiers (1%). The FEIS displays tables containing visitor counts by activity from 1992 through 2000 winter seasons; the following tables add to the sum of these seasons the additional amount of use generated during the 2000-01 season.

Table 22. Winter use activities in YNP.

Winter Season	Visitors by Auto	Recreation Vehicle	Bus Passengers	Skiers	Snowmobile Passengers	Snowcoach Passengers	Total Visitors
2000-2001	38,538	139	3,071	390	84,971	11,683	138,792
Total , 1992-2001	329,287	1,351	6,566	5,352	722,835	103,162	1,168,553
Percent	28%	<1%	<1%	<1%	62%	9%	100%
Average	36,587	150	730	555	80,315	11,462	129,839

The greatest amount of winter visitor traffic is at the West Entrance Station, comprising 48% of the total use since the winter of 1989-90. North Entrance use is next highest at 31%, followed by the South Entrance Station with 19% and East Entrance at 3% of the winter visitor traffic. The FEIS displays a table containing visitor counts by entrance station from 1992 through 2000; Table 23 contains information from the 2000-01 season.

Table 23. Winter use visitors in YNP — by entrance station.

Winter	North	West	South	East	Total
2000-2001	43,226	66,468	24,718	4,380	138,792
Total 1992-2001	454,358	712,894	275,615	46,282	1,489,149
% of total	31%	48%	19%	3%	100%*

The North Entrance is the only YNP entrance that is accessible to wheeled vehicles during the winter season. The FEIS displays a table containing visitor activities for the North Entrance station from 1992 through 2000; Table 24 contains information from the 2000-01 season.

Table 24. Winter use activities in YNP — North Entrance.

Winter	Visitors by Auto	Recreation Vehicle	Bus Passengers	Skiers	Snowmobile Passengers	Snowcoach Passengers	Total Visitors
2000-2001	38,538	139	543	7	1,758	2,241	43,226
Total 1992-2001	329,287	1,351	4,038	111	13,362	20,179	368,328
% of total	89%	<1%	<1%	<1%	4%	5%	100%
Average	36,587	150	449	12	1,485	2,242	40,925

Traffic at the North Entrance point is predominately wheeled vehicles with about 89% of the visitors arriving by automobile, bus, or recreational vehicle. The primary attractions accessible from the North Entrance during the winter season are Mammoth Hot Springs, with its associated facilities and nearby cross-country skiing, and the Lamar Valley with its opportunities to view wolves.

The West Entrance Station is the single busiest entrance to YNP, at which 90% of the visitors used snowmobiles as their mode of travel. The FEIS displays a table containing visitor activities for the West Entrance station from 1992 through 2000; Table 25 contains information from the 2000-01 season.

Table 25. Winter use activities in YNP — West Entrance.

Winter	Skiers	Snowmobile Passengers	Snowcoach Passengers	Total Visitors
2000-2001	67	58,292	8,109**	66,468
Total, 1992-2001	206	498,100	57,293	555,599
% of total	<1%	90%	10%	100%
Average	23	55,344	6,365	61,733

**This number includes bus passengers from March. West Entrance closed 2/25/01 due to unsafe conditions. Road reopened to mass transit vehicles on 3/1/01.

Of the 722,835 visitors entering YNP on snowmobiles during the winter seasons between December 1992 and March 2001, 69% (498,100) arrived at the West Entrance. The West Entrance is not accessible to wheeled vehicles.

For the 2001-02 season, 13 outfitters operate snowcoaches in YNP. Combined, they operate 61 snowcoaches with a total of 671 seats. The following is the current mix of snowcoaches: 2 Prinoths, 26 Bombardiers, 16 conversion vans with steel tracks, 13 conversion vans with Mattracks, and 4 sport utility vehicles with Mattracks.

The East Entrance Station is located on Highway 14/16 connecting to Cody Wyoming. The FEIS displays a table containing visitor activities for the East Entrance station from 1992 through 2000; Table 26 contains information from the 2000-01 season. Visitors using this entrance are primarily snowmobile riders (88%) with cross-country skiers being the second highest percentage at 12%. As with the West Entrance, there is no wheeled vehicle access.

Table 26. Winter use activities in YNP — East Entrance.

Winter	Skiers	Snowmobile Passengers	Snowcoach Passengers	Total Visitors
2000-2001	197	4,183	0	4,380
Total, 1992-2001	4,086	30,641	105	34,832
% of total	12%	88%	<1%	100%
Average	454	3,405	12	3,870

Visitors to YNP who gain access through the South Entrance first travel through GTNP and the Parkway. The FEIS displays a table containing visitor activities for the South Entrance station from 1992 through 2000; Table 27 contains information from the 2000-01 season. As with the entrances other than the North Entrance Station, snowmobiles are the primary mode of transportation. The South Entrance Station had the second highest number of snowcoach passengers and snowmobiles during the reported winters. The South Entrance is not accessible to wheeled vehicles.

Table 27. Winter use activities in YNP — South Entrance.

Winter	Skiers	Snowmobile Passengers	Snowcoach Passengers	Total Visitors
2000-2001	119	20,738	3,861	24,718
Total, 1992-2001	940	180,574	27,990	209,504
% of total	<1%	86%	13%	100%
Average	104	20,063	3,110	23,278

Table 28. Winter use activities in Grand Teton National Park and the John D. Rockefeller Jr., Memorial Parkway, winter seasons 1993-01. Data obtained from NPS visitation records.

Winter Season	The Parkway Snowmobile	CDST Snowmobile	GTNP Snowmobile	GTNP Snow-plane	The Parkway Skiing	GTNP Skiing	Total Visitors
93/94	31268	N/A ²⁰	1,222	1,891	1,548	7,875	6,609
94/95	25,016	1,394	1,113	1,627	1,694	4,723	31,204
95/96	18,004	2,309	2,941	1,384	1,231	6,599	28,735
96/97	19,887	1,930	3,643	1,440	1,294	5,962	30,512
97/98	19,597	1,857	3,951	1,485	1,185	4,151	28,593
98/99	17,160	1,639	3,436	851	1,149	4,242	26,349
99/00	23,400	1,329	4,800	1,091	1,581	5,687	35,654
00/01	31,011	1307	2,618	1,148	1,987	4,774	42,845
Total	154,075	11,765	22,502	10,917	11,669	44,013	254,941
Percent	60%	5%	9%	4%	5%	17%	100%
Average	19,259	1,471	2,813	1,365	1,459	5,502	31,868

GTNP visitor counts include visitors using the Parkway. Flagg Ranch, a commercial operation licensed to provide various visitor services to complement winter use activities, provides visitor accommodation within the Parkway. The Parkway accommodated 154,075 snowmobile visitors for the eight winter seasons between December 1993 and March 2001, a season average of 19,259 snowmobilers.

Visitor counts for GTNP also include snowmobiles using the CDST. This groomed trail is located immediately adjacent to Highways 26/287 and 89/191/287 and traverses the 27 miles between the East Entrance of the park and Flagg Ranch.

VISITOR EXPERIENCE

Discussion of winter visitor experience may be found on FEIS pages 190-196. The FEIS describes existing visitor experience relative to three topics: winter visitor profile data and survey results; a description of peoples' values and expectations about winter use based on survey data; and measures of visitor experience and satisfaction. Conclusions are drawn and supported in the FEIS about the most important aspects of visitor experience relating to the winter plan alternatives and their consequences. This information, incorporated by reference into this SEIS, is briefly summarized here.

²⁰ CDST did not exist until the winter of 1994-1995.

Winter Visitors and Their Activities

Since the late 1980s, winter use in YNP has fluctuated. Visitation climbed rapidly, peaking at about 143,000 winter users in 1993-1994. Use dropped to a low point of about 113,000 in 1996-97 and rebounded to about 139,000 in 2000-2001. Most winter visitors came to view wildlife, scenery, and thermal features, and rated the presence of clean air, quiet, and solitude as very or extremely important to their visits (Littlejohn 1996). In YNP and GTNP, an average of 75% of winter visitors ride snowmobiles, 12% ride in snowcoaches, 20% use cross-country skis, 2% use snowshoes, and 22% drive automobiles (Littlejohn 1996). Most people who visited YNP from outside Wyoming came from Montana, Utah, Idaho, and Minnesota. For GTNP and the Parkway, most non-Wyoming visitors came from Idaho and California (Littlejohn 1996). Snowmobilers from Wyoming, Montana and Idaho heavily use areas within their own states for snowmobiling. YNP's average winter visitor is a highly educated, relatively wealthy, middle-aged white male. The average age of winter visitors to YNP in 1998 was 45 years old; over half were college graduates; almost 70% lived in a community of 5,000 or more; and their average household income is between \$60,000 and \$80,000. Thirty percent of survey respondents reported annual incomes over \$100,000 (Borrie et al. 1999).

Most visitors report participation in winter recreation outside the parks, in national forests and other recreation areas. Snowmobiling and skiing were the most popular pursuits (Littlejohn 1996). National Forests and other recreation areas in states immediately bordering the parks offer more opportunities for winter recreation, and receive much more use than the three parks. Snowmobiling was the most popular activity for visitors entering the East and West entrances, at about 93% and 89% respectively. Cross-country skiing was the most popular activity for visitors to the North Entrance of YNP and GTNP. Over 70% of North Entrance visitors indicated that wildlife viewing was a primary activity during their visit. Viewing geysers was popular with West Entrance visitors. Between 9 and 10% of visitors listed snowcoach tours as a primary activity.

Values and Expectations of Visitors

People care about YNP as a place of scenic beauty, where wildlife is protected, and where everyone should visit. Survey respondents cared least about YNP as an economic resource. The top three reasons people visited YNP in the winter were to view natural scenery, to have fun, and to view bison. YNP visitors reported gaps between importance of several characteristics of their visit and the degree of satisfaction with the experience for that

characteristic. For example, the importance of “experience the tranquility” was sixth, while the satisfaction with that characteristic was eighteenth. “Experience peace and quiet” was rated 14th in importance, and 25th in satisfaction. “Get away from crowds” had the largest gap: it was 17th in importance, and 40th in satisfaction. This indicates people feel that the values of tranquility, peace and quiet, and solitude are important and anticipated, but that they were often dissatisfied with their actual experience (Borrie et al.1999).

Another survey of winter visitors gauged the primary reasons why they visit these particular parks (Littlejohn 1996a). The following table illustrates the results.

Table 29. Survey-primary reasons for visitation to the parks.

Reasons for Visit	YNP	GTNP
View Scenery	76%	73%
View Wildlife	76%	68%
Take Photographs	63%	66%
Snowmobiling	61%	30%
X-C Skiing	29%	59%
Downhill Skiing	11%	27%
Snowshoeing	1%	17%
Satisfy Curiosity	-	35%

Snowmobilers who reside in Montana and nonresidents vacationing in Montana were asked to give reasons for engaging in their sport (Sylvester and Nesary 1994). Results of this poll are given in Table 30.

Table 30. Top reasons for snowmobiling in Montana.

Reason for snowmobiling	Resident	Nonresident
Observe scenic beauty	81.5%	87.7%
Take in natural surroundings	68.7%	84.2%
Enjoy smells and sounds of nature	57.2%	55.9%
Understand the natural world better	21.1%	30.3%
Learn more about nature	22.6%	33.8%
Get away from other people	41.5%	37.7%
For solitude and privacy	38.4%	45.1.%
So my mind can move at a slower pace	19.9%	24.6%

In 1998 Teton County, Wyoming conducted a survey of county residents concerning their opinions on winter use in the three parks (Teton County 1998). Respondents to this survey were asked, regardless of usage, what they liked and disliked about the parks in winter. In Yellowstone snowmobiling was the number one “like” answer (43%) among respondents, who had at some time visited Yellowstone, while beauty was the number one response for non-users. For GTNP cross-country skiing was the most popular “like” response (27%) among users and beauty was most popular among nonusers (38%). Of the “dislikes” for YNP, responses were evenly distributed among users and nonusers, who gave the following responses: dislike snowmobiling, snowmobiling traffic, snowmobile pollution, snowmobile noise, and crowds. GTNP respondents did not like the cost, snowmobiles, snowmobiles off trail, and crowds. Users (51%) and nonusers (61%) supported limits on snowmobiles. A smaller percentage of respondents supported limiting snowmobiles in GTNP with 47% of users and 40% of nonusers supporting limits. However, regarding overall visitation, most survey respondents felt that current levels of visitation were the right amount (66% of users and 57% of nonusers in YNP). In GTNP 84%, of users and 75% of nonusers felt that current use levels were about right.

During the 1998-1999 winter and summer seasons, the NPS sponsored three surveys relating to the socioeconomic impacts of winter management changes within the three park units. The first survey targeted winter visitors within the GYA (Duffield et al. 2000a). The other two surveys targeted summer visitors to YNP (Duffield et al. 2000b) and the US population as a whole, as well as local and regional residents (Duffield et al. 2000c). The results of these surveys may be found earlier in this chapter in the section *Socioeconomics, Social Values*. Although the results are not reiterated here in their entirety, several findings from the survey are pertinent to the discussion of visitor experience and satisfaction presented below.

Respondents to the three surveys differed somewhat demographically. Winter survey respondents, as mentioned previously, were primarily white (99%), well educated, and relatively wealthy. Sixty-six percent of winter survey respondents were male. Summer visitors were predominately white (98%) and male and female respondents were evenly split at 50%. The national telephone respondents were also predominantly white (91%), but a higher percentage of other ethnic and racial groups were represented. Of this group of respondents 6.5% were African American; 2.8% were Asian; 1.3% were American Indian;

and 6.8% were “Other”. Like the summer survey, respondents to the telephone survey were evenly mixed between males and females.

Although all respondents favored oversnow access to the parks, the summer and telephone respondents were evenly divided between preferring access by snowcoach only and access by snowmobile. A larger portion of the telephone and summer respondents also expressed a preference for limiting use to skiing and snowshoe access only. Overall, respondents to all the surveys indicated concern about the welfare of wildlife. When questioned whether they would favor limiting access to the parks to protect wildlife (for example, bison) regional and national telephone respondents and summer visitor respondents favored closing roads, while local telephone and winter visitors favored visitor access.

The quality of the groomed road surface was the most useful indicator of the satisfaction of visitor's with oversnow travel in Yellowstone (Borrie et al. 1999). More than 80% of winter visitors rate the quality of the road surface as very important. One of the characteristics of snowroads is that moguls (bumps) develop in the road surface as a result of oversnow traffic. Snowroads are groomed in part to help define the travel surface and to provide a smooth surface for vehicles to use. On warmer winter days with heavy snowmobile traffic, the road surface can become so deeply moguled as to render it unsafe for travel. Yellowstone has occasionally closed the West Entrance road due to both safety concerns and because snowmobilers start to leave the road surface and go cross-country to find smoother conditions. These concerns were echoed by NIOSH in their review of employee health and safety issues related to winter travel (*see Employee Health and Safety Section*).

Park staff and other long-time users have recognized there is a relationship between the smoothness of the travel surface and a variety of factors. Those factors include, but are not limited to, temperature (both daytime and overnight), grooming, number of oversnow vehicles, type of oversnow vehicles, and snowfall history. Snow is a very dynamic material and is constantly changing. Despite all the variables, however, temperature seems to play a very important role. In very cold conditions, more vehicles can be accommodated without undue moguling, whereas in warmer, near freezing conditions, relatively few vehicles create significant bumps.

To help better understand these relationships and see if they could be quantified, the National Park Service contracted with the Keweenaw Research Center at Michigan Technological University to conduct a mogul study (Alger et al. 2000). They concluded that bumps reappear in the same locations day after day, and that the bumps reached an

equilibrium after a fixed number of snowmobiles. Although the authors had observed a temperature bump formation relationship in other work, they did not observe it in the YNP study. They also concluded, in general, warm snow does not bond well and in turn forms bumps rapidly.

Recent Publications

Results from 2000-2001 Wyoming Snowmobile Survey

This survey was prepared by the Department of Agriculture and Applied Economics at the University of Wyoming. It was sponsored by the Wyoming Department of State Parks and Historic Sites, the University of Wyoming, and the Wyoming State Snowmobile Association.²¹

The survey included both resident and non-resident respondents. A sample of 1,019 nonresidents and 1,073 residents with registered snowmobiles were chosen randomly from the total Wyoming State Trail Program database.

The reports describe methods and results in greater volume than can effectively be summarized. An Executive Summary is provided in Appendix D. Information from the report is also included in the Socioeconomics section of this document. For each report, some notable results that relate to visitor experience in the parks are shown below.

YNP was ranked as the fifth most preferred trail area among resident Wyoming snowmobilers (24.7%). However, Yellowstone was not indicated as a primary destination for this group, accounting for only 2.7% of total trips taken last season. Resident snowmobilers indicated that they would reduce their number of snowmobile trips in Wyoming by 9% if YNP were closed to snowmobile access. The majority of residents (91%) also responded that they would not consider going to YNP if the only winter access was by snowcoach.

Yellowstone was not ranked as a primary destination area among nonresidents and accounted for 3.5% of total trips taken last season. Nonresidents indicated that they would reduce their snowmobiling days in Wyoming by 13% if they were no longer able to snowmobile in the parks. Nonresident snowmobilers (93%) also said that they would not consider going to Yellowstone if the only access were by snowcoach.

²¹ McManus, Coupal and Taylor, August 2001

The preferred solutions for "resolving the snowmobile conflict in national parks" as indicated in the 2000-2001 Wyoming Snowmobile Survey are listed below.

Table 31. Wyoming residents preferred solution for snowmobile conflict in national parks.

Response	Percent
No ban but requirement of cleaner quieter machines	35.0%
No ban and no additional requirements	34.2%
Limited snowmobile access per day or per season	19.6%
Partial Snowmobile ban of highly sensitive areas	11.4%
Lottery or permit system	5.0%
Complete ban of both snowmobiles and snowcoaches	2.0%
Rotation of snowmobiles allowed areas every season	2.0%
Complete snowmobile ban with snowcoaches allowed	1.6%
No opinion	1.4%
Other	15.2%

Table 32. Nonresidents preferred solution for snowmobile conflict in national parks.

Response	Percent
No ban and no additional requirements	37.4%
No ban but requirement of cleaner quieter machines	28.2%
Partial snowmobile ban of highly sensitive areas	17.2%
Limited snowmobile access per day or per season	12.1%
Rotation of snowmobiles allowed in certain areas every season	4.0%
Lottery or permit system	4.0%
Complete ban of both snowmobiles and snowcoaches	2.4%
No opinion	1.8%
Complete snowmobile ban with snowcoaches allowed	1.1%
Other	14.3%

Snow condition ranked as the most important natural feature for choosing a Wyoming snowmobile area among all snowmobilers, with 80.8% of nonresidents and 63.8% of residents rating this aspect in the top three natural features. The two other natural features that most attracted survey respondents were off-trail powder areas and scenic views. Wildlife viewing was ranked as a top natural trail feature by 19.6% of resident respondents and 12.7% of nonresidents.

Table 33. Ranking of top three natural trail features by residents.

Natural Feature	Percent
Snow conditions	63.8%
Off trail powder	59.6%
Scenic views	45.3%
Open areas	33.1%
Solitude	31.9%
Trail availability/quality	22.7%
Rugged terrain	19.7%
Wildlife viewing	19.6%
Other	4.0%

Table 34. Ranking of top three natural trail features by nonresidents.

Natural Feature	Percent
Snow conditions	80.8%
Off trail powder	77.3%
Scenic views	38.7%
Open areas	29.2%
Solitude	22.0%
Trail availability/quality	19.4%
Rugged terrain	16.9%
Wildlife viewing	12.7%
Other	1.1%

Half of resident Wyoming snowmobilers did not see a need for cleaner and quieter snowmobiles but 50% also said they would pay more to use them if these vehicles were available. A minority of nonresidents (28.2 percent) thought there was a need for cleaner and quieter snowmobiles, but 50.5 percent of all respondents said they would pay more to use them if these vehicles were available.

Overall, both nonresident and resident Wyoming snowmobilers were satisfied or very satisfied with snowmobiling in Wyoming (97% and 96% respectively). Both groups also indicated that the availability of parking was a concern. Nonresidents were also concerned with the availability of shelter, trail signing and trail maintenance and grooming.

The survey results from the 2000-2001 Wyoming Snowmobile survey are for the most part consistent with the other survey results concerning the snowmobile experience discussed in Chapter 3 of the FEIS (pages 190-196). Small differences in the importance ranking of solitude and wildlife viewing are noted and may be due to the expected differences between a statewide recreation survey and park specific survey. Based on an evaluation of the survey results discussed in this chapter and in the FEIS, the most important aspects of visitor experience that relate to winter use plans for the national parks are summarized as:

- Opportunities to view wildlife. Winter visitors consistently rate wildlife viewing as a primary reason for visiting the parks. Respondents to the surveys conducted by Duffield et al. (2000a, 2000b and 2000c) were concerned about the possible disturbance of wildlife in the winter. There also appeared to be support from regional and national survey respondents to accept changes in access policy if there was a corresponding benefit to wildlife.
- Opportunities to view scenery. Winter visitors rate viewing scenery as the primary reason for visiting the parks.
- The safe behavior of others. Both snowmobilers and skiers rate this as important and indicate that it has an influence on the enjoyment of their visit.
- Quality of the groomed surface. More than 80% of winter visitors rate the quality of the snow surface as very important.
- Availability of access to winter activities or experiences. Nearly all winter visitors surveyed by Borrie et al. (1999) support oversnow mechanized access as opposed to plowed roads. Winter respondents to the 1998-1999 winter survey (Duffield et al. 2000a) also favored oversnow access for snowmobiles. Over 90% of the respondents to the Wyoming Snowmobile Survey indicated that they would not visit YNP if the only mechanized access were by snowcoach (Wyoming 2001). Respondents to the summer visitor sample (Duffield et al. 2000b) and the phone sample (Duffield et al. 2000c) were more evenly mixed between groomed roads for snowcoaches and groomed access for snowmobiles. Plowed roads also received very low support in the summer and telephone surveys.
- Availability of information. Most respondents are supportive of management actions that provide readily available information about winter opportunities or conditions for safe travel.
- Quiet and solitude. Most survey respondents feel that natural quiet and solitude was important to their park visit. Many were dissatisfied with their desired experience in this regard. About 30% of Wyoming Snowmobile respondents rated this as one of their top three natural trail features.
- Clean air. Clean air is important to most visitors surveyed. This is supported by past national survey results that indicate recreating Americans highly value clean air in their visits to public lands.

ADJACENT LANDS

Discussion of lands and jurisdictions adjacent to the three park units in the Greater Yellowstone Area may be found on FEIS pages 197-198. This information, incorporated by reference into this SEIS, is briefly summarized here.

GYA land ownership or jurisdiction, which excluded the southern portions of both the Bridger Teton and Shoshone National Forests, is a mix of federal, state, and private lands. The 31,000 square miles in the GYA are comprised of the following ownership or jurisdictions:

- National forests (51%)
- Private ownership (24%)
- National parks (13%)

CHAPTER III
AFFECTED ENVIRONMENT

- Other federal agency jurisdictions (BLM, USFWS, and Bureau of Reclamation; (5%)
- Indian reservations (4%)
- State owned lands (3%).

About 95% of the perimeter of GTNP, YNP and the Parkway abuts national forest lands. A high percentage of the national forest system along this common boundary is in congressionally designated wilderness, and inventoried or other roadless areas. Other lands are in wildlife preserves, such as the National Elk Refuge, or other similar designations. Near the gateway communities to both YNP and GTNP, mostly private lands abut the parks.